



July 30, 2020
Terminal 4 Remedy



Pre-Remedial Design Investigation Summary Report

Prepared for U.S. Environmental Protection Agency, Region 10

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Appendix B	Deviations from the PDI Work Plan
Appendix C	Field Sampling Photographs
Appendix D	Laboratory Data Reports
Appendix E	Data Validation Reports
Appendix F	Data Replacement Evaluation for Terminal 4

ABBREVIATIONS

µg/kg	micrograms per kilogram
30% RD	Preliminary 30% Remedial Design
Apex	Apex Laboratories LLC
ASAOC	Administrative Settlement Agreement and Order on Consent
BODR	Basis of Design Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
COC	contaminant of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CRD	Columbia River Datum
CSM	conceptual site model
CUL	cleanup level
D/F	dioxin/furan
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DDx	the sum of DDT, DDD, and DDE
DGPS	differential geographic positioning system
EDL	estimated detection limit
EMPC	estimated maximum possible concentration
ESD	<i>Explanation of Significant Differences, Portland Harbor Superfund Site</i>
FS	Feasibility Study
HxCDF	1,2,3,4,7,8-hexachlorodibenzofuran
NAPL	nonaqueous phase liquid
NAVD88	North American Vertical Datum of 1988
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDI	pre-remedial design investigation
PDI Summary Report	<i>Pre-Remedial Design Investigation Summary Report</i>
PDI Work Plan	<i>Pre-Remedial Design Investigation Work Plan</i>
PDI Work Plan Addendum No. 1	<i>Pre-Remedial Design Investigation Work Plan Addendum No. 1</i>
PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin
PeCDF	2,3,4,7,8-pentachlorodibenzofuran
Port	Port of Portland
Pre-RD Group data	surface sediment data from the <i>PDI Evaluation Report</i>

PTW	principal threat waste
QA	quality assurance
QC	quality control
RAL	remedial action level
RD	Remedial Design
RL	reporting limit
RM	river mile
ROD	<i>Record of Decision: Portland Harbor Superfund Site</i>
SDU	Sediment Decision Unit
SMA	sediment management area
SOW	<i>Remedial Design Statement of Work, Portland Harbor Superfund Site</i>
SQAPP	<i>Sampling Quality Assurance Project Plan</i>
T4	Terminal 4
T4 SDU	Sediment Decision Unit RM 4.5E
TADT	Technology Application Decision Tree
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	2,3,7,8-tetrachlorodibenzofuran
TOC	total organic carbon
USEPA	U.S. Environmental Protection Agency
Vista	Vista Analytical Laboratory

1 Introduction

This *Pre-Remedial Design Investigation Summary Report* (PDI Summary Report) has been prepared by Anchor QEA, LLC, on behalf of the Port of Portland (Port) for the Terminal 4 (T4) Action Area (as defined in the Administrative Settlement Agreement and Order on Consent [ASAOC] for Remedial Design [RD] for T4), which is located on the east bank of the Willamette River between river miles (RM) 4.2 and 5.0 in Portland, Oregon (Figure 1-1). This PDI Summary Report has been prepared under the ASAOC (Docket No. Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] 10-2004-0009), as amended on June 21, 2018, and the *Remedial Design Statement of Work, Portland Harbor Superfund Site* (SOW; USEPA 2018).

The *Pre-Remedial Design Investigation Work Plan* (PDI Work Plan), which includes the PDI Work Plan (Anchor QEA 2019a) and PDI Work Plan Addendum No. 1 (Anchor QEA 2019b), presented pre-RD data gaps and the recommended field investigations to fill data gaps for preliminary sediment management area (SMA) delineation, conceptual site model (CSM) refinement, and application of the Technology Application Decision Tree (TADT), which is Figure 28 of the *Record of Decision: Portland Harbor Superfund Site* (ROD; USEPA 2017a). Consistent with the SOW, this PDI Summary Report evaluates whether the pre-remedial design investigation (PDI) data, along with existing data, are sufficient to complete the Basis of Design Report (BODR) and Preliminary 30% RD (30% RD).

1.1 Purpose and Objectives

The purpose of the PDI was to identify and address data gaps by conducting field investigations to develop the BODR, RD Work Plan, and RD. More specifically, the purpose of this PDI was to evaluate existing data for the T4 Action Area, also known as Sediment Decision Unit (SDU) RM 4.5E (herein termed the T4 SDU), and identify data gaps for delineating SMAs, refine the CSM, and apply the TADT (Figure 28 of the ROD) consistent with the ROD (USEPA 2017a). Consistent with the SOW, the purpose of the PDI Summary Report is to present the following:

- Summary of the investigations performed (i.e., the PDI)
- Summary of investigation results
- Summary of validated data (i.e., tables and graphics)
- Data validation reports and laboratory data reports
- Narrative interpretation of data and results
- Results of statistical and modeling analyses, if applicable
- Photographs documenting the work conducted
- Conclusions whether the data are sufficient to complete the BODR and 30% RD

1.2 Site Description and Background

The T4 Action Area, also known as Sediment Decision Unit (SDU) RM 4.5E (herein termed the T4 SDU) within Portland Harbor, comprises Slip 1, Wheeler Bay, and Slip 3, as well as downstream Berth 401, upstream Berth 414, and the offshore area in between these two berths (Figure 1-1). Each subarea (collectively referred to hereafter as the “site subareas”) is summarized as follows:

- **Slip 1** is inactive with no existing water-dependent use but may be developed in the future for shallow-draft barge use.
- **Wheeler Bay** is an inactive bay with no existing water-dependent use and none anticipated in the future. Stabilization of the Wheeler Bay shoreline occurred as a source control measure during the 2008 T4 Phase I Removal Action (Anchor QEA 2009).
- **Slip 3** contains Berths 410 and 411, which are the main sites of active marine operations serving deep-draft, ocean-going vessels with an 80% occupancy rate. Berths 410 and 411 are along the north side of Slip 3. A sheetpile wall along the southern edge of the pier adjacent to Berths 410 and 411 physically separates open-water and underpier sediments in Slip 3 (Figure 1-1). The sheetpile wall was installed in 2004 from a minimum tip elevation of -80 feet Columbia River Datum (CRD) to a pile cutoff elevation of -20 feet CRD. Following maintenance dredging in 2017, sediments adjacent to the sheetpile wall were at or below -40 feet CRD (Hart Crowser 2018). Berth 410 is regularly maintenance dredged, most recently in 2017. Berth 411 was a primary focus of remedial dredging during the 2008 T4 Phase I Removal Action. The south side of Slip 3 (i.e., former Pier 5) is inactive.
- **Berth 401** is located downstream of the mouth of Slip 1 and is used as a lay berth and for the transfer of bulk liquid fertilizers to the International Raw Materials terminal facility. Berth 401 is regularly maintenance dredged, most recently in 2015.
- **Berth 414** is located upstream of the mouth of Slip 3 and is used to unload automobiles from deep-draft ocean-going vessels to the Auto Storage Area located in the southern portion of T4. A small removal action (approximately 0.1 acre) was performed downstream of Berth 414 during the 2008 T4 Phase I Removal Action to remove a localized deposit of total polycyclic aromatic hydrocarbons (PAHs) exceeding the PAH removal action levels.

The sediments in areas offshore of the site subareas are generally low in concentrations for the focused contaminants of concern (COCs) (i.e., lower than remedial action levels [RALs] in the ROD) and in relatively deep water (i.e., greater than -20 feet CRD) and are likely affected by sedimentary processes in the adjacent mainstem river and navigation channel. These offshore areas serve as access to and from the active T4 berths.

Due to the different physical characteristics and current uses in these five site subareas, PDI results are presented by subarea throughout this report.

1.3 2018 Data Collected in the T4 SDU

Surface and subsurface data were collected by the Pre-RD Group in 2018 (AECOM and Geosyntec 2019) throughout Portland Harbor. That sampling event included 24 surface sediment locations and 2 subsurface sediment core locations within the T4 SDU. Pre-RD Group data are combined with the Port PDI data in Section 6 figures to assist with data analysis and initial refinement of SMA delineation. A brief summary of these data, as they relate to the T4 SDU and PDI, is provided in Section 6.1.

The Pre-RD Group also conducted a detailed bank-to-bank bathymetry survey in 2018 from RMs 1.9 to 11.8 of the Lower Willamette River, including areas within the T4 SDU (AECOM and Geosyntec 2019). Bathymetry data were collected by David Evans and Associates and included multibeam sonar depth readings supplemented by single-beam data in areas of limited access. Bathymetric coverage extends up to an elevation of +13.0 feet North American Vertical Datum of 1988 (NAVD88) in accessible areas. Bathymetric changes, including net changes in sediment bed elevations from 2004 to 2018, are discussed in Appendix F with respect to the surface sediment data replacement evaluation for the T4 SDU.

1.4 Document Organization

The remainder of this document is organized into the following sections:

- Section 2: Pre-Remedial Design Investigation Overview
- Section 3: Chemical and Physical Data Quality
- Section 4: Surface Sediment Testing
- Section 5: Subsurface Sediment Testing
- Section 6: Objectives of the PDI and Surface SMA Delineation
- Section 7: References

The following appendices are attached to this document:

- Appendix A: Field Sampling Logs
- Appendix B: Deviations from the PDI Work Plan
- Appendix C: Field Sampling Photographs
- Appendix D: Laboratory Data Reports (on DVD)
- Appendix E: Data Validation Reports (on DVD)
- Appendix F: Data Replacement Evaluation for Terminal 4

2 Pre-Remedial Design Investigation Overview

This section provides an overview of the T4 PDI, which was completed in April and May 2019 and included open-water surface sediment, underpier surface sediment, and subsurface sediment sampling activities. The PDI components described in Sections 2.1 and 2.2 were performed to fulfill data gaps identified in Section 2.3 of the PDI Work Plan (Anchor QEA 2019a) and Section 3 of the PDI Work Plan Addendum No. 1 (Anchor QEA 2019b) and provide the necessary data to evaluate existing data for the T4 SDU and identify data gaps for delineating SMAs, refining the CSM, and applying the TADT (Figure 28 of the ROD) consistent with the ROD (USEPA 2017a).

The PDI sampling design, including the number and type of samples collected, the types of analyses that were conducted, and details of the sampling methodologies used, are provided in this section. Tables 2-1 and 2-2 present a summary of the PDI surface and subsurface sediment sampling, respectively. Figures 2-1 and 2-2 present the PDI surface and subsurface sediment sampling locations, respectively.

Quality control (QC) measures implemented during PDI data collection efforts are summarized in Section 3. Field sample collection logs are presented in Appendix A. Deviations from the PDI Work Plan are summarized for each sampling methodology in Sections 2.1.3 and 2.2.3; field deviation forms are provided in Appendix B.

2.1 Surface Sediment Sampling

Surface sediment sampling was performed throughout each of the five site subareas (Figure 1-1) to address the following PDI data gaps, which are described in detail in Section 2.3 of the PDI Work Plan (Anchor QEA 2019a):

- Current surface sediment conditions (e.g., sediment characteristics such as grain size and organic carbon content; in both open-water and underpier areas)
- Extent of surface PAH, polychlorinated biphenyl (PCB), and dioxin/furan (D/F) concentrations
- Extent of PCB-related principal threat waste (PTW), if any

Surface sediment samples were collected in open-water and underpier areas in accordance with the PDI Work Plan, as further detailed in Sections 2.1.1 and 2.1.2. A summary of deviations from the PDI Work Plan is also provided for each type of sampling (Section 2.1.3). These deviations were discussed with and approved by the U.S. Environmental Protection Agency (USEPA) and documented during the sampling program.

Table 2-1 summarizes the collection date, location information, and sample intervals for the open-water and underpier surface sample stations. All surface samples were collected as three-point composites with specified separation distance between discrete stations in accordance with the PDI

Work Plan. Information in Table 2-1 represents the composite samples. Composite coordinates were determined by calculating the centroid of the three discrete samples and composite elevations, and sample intervals were recorded as the average of the three discrete samples. All surface sediment samples were analyzed for grain size, total solids, total organic carbon (TOC), PAHs, and PCB congeners. D/F analysis was performed on approximately 70% of surface samples consistent with the PDI Work Plan.

2.1.1 Open-Water Surface Sediment Grabs

Open-water surface sediment samples (0 to 30 centimeters [cm]) were collected at 53 sample locations in the T4 SDU from April 15 to May 3, 2019 (Figure 2-1). Open-water surface sediment samples were collected as three-point composites using a clamshell-type pneumatic power grab sampler deployed from a sampling vessel. Discrete open-water sediment grab samples were collected within the separation distances (10 to 25 feet) proposed in the *Sampling Quality Assurance Project Plan* (SQAPP; Anchor QEA 2019a, Appendix A). Sample locations were identified and documented using an onboard differential geographic positioning system (DGPS).

Following discrete sample retrieval, samples were evaluated for acceptability based on acceptance criteria detailed in Section 3.3.1.2.1 of the SQAPP. Sediment from each accepted discrete sample was then homogenized using stainless-steel spoons and bowls. After collection and processing of all three discrete grab samples for one location, approximate equal amounts (by volume) of material were combined and homogenized in a separate bowl. Sample containers were then filled with the composited material and prepared for transport to the laboratory. Surface sediment collection forms are provided in Appendix A, and sampling photographs are provided in Appendix C.

Trace amounts of sheen were observed during sampling at seven open-water locations throughout the Slip 3 subarea (SG05, SG08, SG11, SG13, SG16, SG17, and SG18) and at one open-water location in the Slip 1 subarea (SG54; near the head of the slip). No sheens were observed during sampling of open-water stations in the Berth 414, Wheeler Bay, or Berth 401 subareas. No nonaqueous phase liquid (NAPL) was observed in any surface or subsurface PDI samples. Sheen observations are presented in Appendix A.

A total of 56 open-water surface sediment samples (including three field duplicates) from 53 stations were submitted to analytical laboratories for chemical testing.

2.1.2 Underpier Surface Sediment Grabs

Samples from nine underpier surface sediment sample locations were collected from May 28 to May 31, 2019 (Figure 2-1). Underpier samples were collected as three-point composites using a diver-operated, stainless-steel hand core sampler. Discrete underpier grab samples were collected within the separation distances (5 to 10 feet) proposed in the SQAPP. Positioning was obtained by

locating the diver along the pier face directly downslope from the target location. The diver then laid out a measuring tape starting at the pier face to the target location. This tape distance was converted to a horizontal distance using the slope of the sediment surface (calculated using start and end water depths) and then adjusted as necessary to achieve proper positioning at the target sampling location.

After collection of three acceptable discrete samples at a location, sediment was processed and composited consistent with the methods used for the open-water surface grabs (Section 2.1.1).

Traces of sheen were observed during sampling at one underpier location in the Slip 3 subarea (SG26) and at one underpier location in the Slip 1 subarea (SG41), both near the head of each slip. No NAPL was observed in any surface or subsurface PDI underpier samples. Sheen observations are presented in Appendix A.

A total of 10 underpier surface sediment samples (including one field duplicate) from nine stations were submitted to analytical laboratories for chemical testing.

2.1.3 Deviations from the PDI Work Plan

This section summarizes deviations from the PDI Work Plan that occurred during the PDI surface sampling due to unanticipated access, recovery, and/or safety issues encountered at several target locations. All field sampling deviations were discussed with and approved by USEPA during the sampling program. Deviation forms are provided in Appendix B.

2.1.3.1 Offset Sample Locations

Several open-water sample locations were offset from the target location due to the presence of debris, riprap, or a steep slope, as well as recovery and accessibility issues. In accordance with SQAPP guidelines, all offsets greater than 50 feet from the target sample location required USEPA notification and approval prior to implementation. A summary of the sample locations offset by more than 50 feet is as follows:

- SG04: Offset by 75 feet from target location due to presence of debris
- SG05: Offset by 75 feet from target location due to recovery issues (i.e., poor recovery)
- SG06: Offset by 100 feet from target location due to recovery issues
- SG34: Offset by 75 feet (toward the channel) from target location due to access and recovery issues
- SG35: Offset by 55 feet (toward SG48) from target location due to access and recovery issues
- SG62: Offset by 80 feet from target location due to presence of a steep slope with riprap and debris
- SG63: Offset by 75 feet from target location due to presence of a steep slope with riprap and debris

- SG64: Offset by 115 feet from target location due to presence of a steep slope with riprap and debris

2.1.3.2 Abandoned Sample Locations

The following three surface sediment sample locations were abandoned due to access, safety, or recovery issues (e.g., poor or no recovery):

- SG07: No sample was collected due to access limitations based on the presence of piles. The necessary offset distance to successfully collect a sample would have been redundant with a previously collected Pre-RD Group surface sediment sample.
- SG39 (underpier): No sample was collected due to safety issues, including significant amounts of unstable debris, steep slopes, and horizontal pilings, as well as insufficient substrate for sampling.
- SG65: No sample was collected due to the presence of a steep slope composed of riprap and debris. The necessary offset distance to successfully collect a sample would have been redundant with sample location SG57.

2.1.3.3 Archived Samples

Based on the SQAPP, one archive jar was to be filled for each discrete grab sample in case individual analyses were needed to refine the results of the composite sample. This course of action was followed for the first sample location. The additional time required to collect and process discrete archive samples did not provide reasonable benefit over collection of composite-only archive samples due to the proximity of the discrete samples to each other and the homogeneity of sediment conditions. After discussing and confirming with USEPA via email on April 16, 2019, USEPA determined that discrete grab archives were unnecessary and were eliminated from the sampling program. Collection of discrete archive samples would only occur if visual observations of the discrete samples were notably different. Discrete archives were only collected at one sample location (SG16) due to the unique observation of a single small oily bleb (0.25 cm in size) in one of the three discrete samples. No NAPL was observed in any PDI samples.

2.2 Subsurface Sediment Sampling

Subsurface sediment sampling was performed in each of the five site subareas to address the following data gaps, which are described in detail in Section 2.3 of the PDI Work Plan (Anchor QEA 2019a) and Section 3 of the PDI Work Plan Addendum No. 1 (Anchor QEA 2019b):

- Underpier subsurface sediment conditions (e.g., grain size)
- Extent of subsurface PAH, PCB, and DDX (the sum of DDT, DDD, and DDE) concentrations in unbounded cores where the vertical extent is not currently established
- Extent of PCB-related PTW in a portion of Slip 1 and Berth 401

- Extent of subsurface D/F contamination in areas where D/F RALs were exceeded in surface and subsurface sediment

Subsurface sediment samples were collected in open-water and underpier areas in accordance with the PDI Work Plan, as further detailed in Sections 2.2.1 and 2.2.2. A summary of deviations from the PDI Work Plan and PDI Work Plan Addendum No. 1, which were discussed with and approved by USEPA and documented during the sampling program, is also provided for each type of sampling (Section 2.2.3). Table 2-2 summarizes the collection date, coordinates, penetration depth, and recovery for the open-water and underpier subsurface sample stations.

2.2.1 Open-Water Sediment Cores

Open-water subsurface sediment cores were collected at 17 sample stations in the T4 SDU from May 20 to May 24, 2019 (Figure 2-2). Open-water subsurface cores were collected using a vibracore sampler deployed from a sampling vessel. Sample locations were identified and documented using an onboard DGPS.

Following collection, cores were evaluated for acceptability based on acceptance criteria detailed in Section 3.3.2.2.1 of the SQAPP. Accepted cores were logged and described, and subsequently segmented into 2-foot intervals, sampled, and homogenized by the upland processing team using stainless-steel spoons and bowls. Sample containers were then filled with the homogenized sediment and prepared for transport to the laboratory. Subsurface sediment core logs are provided in Appendix A, and sampling photographs are provided in Appendix C.

Traces of sheen were observed during core collection at stations SC03 (Berth 414 subarea), SC13 (Slip 3 subarea), SC28 (Wheeler Bay subarea), and SC67 (Berth 401 subarea). In most instances, sheens were observed in rejected attempts; no sheens were observed during core processing. No sheens were observed during core collection in the Slip 1 subarea. No NAPL was observed in any PDI samples. Sheen observations at subsurface locations are presented in Appendix A.

A total of 78 subsurface samples were collected from the 17 open-water core locations. A total of 46 samples from 13 of these open-water core stations were submitted to analytical laboratories for chemical and conventional parameter testing, including six field duplicates. Consistent with the SQAPP, samples were collected from approximately 2-foot depth intervals from each core, based on recovery and the sampling objectives in the PDI Work Plan and Table 6b in the PDI Work Plan Addendum No. 1. Samples that were not proposed for analysis were archived.

2.2.2 Underpier Sediment Cores

Underpier subsurface sediment cores were collected at 7 of the 10 proposed sample stations in the T4 SDU from May 28 to May 31, 2019 (Figure 2-2). Underpier subsurface cores were collected using a

diver-assisted core sampler. Positioning was obtained as described for underpier surface grabs in Section 2.1.2.

Following collection, cores were evaluated for acceptability based on acceptance criteria detailed in Section 3.3.2.2.2 of the SQAPP. Consistent with the SQAPP, the accepted cores were then logged and described, and subsequently segmented into approximately 1-foot intervals (where possible based on recovery), sampled, and homogenized using stainless-steel spoons and bowls. Sample containers were filled with the homogenized sediment and prepared for transport to the laboratory. Subsurface sediment core logs are provided in Appendix A, and sampling photographs are provided in Appendix C.

No sheens or NAPL were observed during underpier core collection or processing at T4.

All underpier subsurface sediment samples submitted to the analytical laboratories (i.e., a total of 20 samples from seven underpier core locations) were initially archived; select underpier core archive samples were triggered for analytical testing following review of underpier surface sediment data, as detailed in Section 4.

2.2.3 Deviations from the PDI Work Plan

This section summarizes field sampling deviations from the PDI Work Plan that occurred during the PDI subsurface sampling due to unanticipated access, recovery, and/or safety issues encountered at several target locations. All field sampling deviations were discussed with and approved by USEPA during the sampling program. Deviation forms are provided in Appendix B.

2.2.3.1 Modifications to Underpier Core Acceptance Criteria

The acceptance criteria for underpier diver-assisted core collection was modified, with USEPA approval, due to site conditions, diver safety concerns including diver fatigue with multiple coring attempts, and poor sample recoveries at some target locations. Based on these issues, the acceptance criteria for the diver-assisted core collection program was modified as follows:

- The diver team used a steel probing rod to estimate sediment thickness prior to attempting a core at the target location.
- The diver probed for suitable sediment depth (3 feet or more) downslope toward the face of the pier if sufficient material was not found at the target location.
- If 3 feet or more of sediment thickness was identified with the probe, a core was attempted.
- If core penetration was greater than 1.5 feet, a core was collected.
- No more than one core attempt was made at each station.
- If 3 or more feet of sediment was not identified with the probe at or within 50 feet downslope of the target location, the location was abandoned.

2.2.3.2 Abandoned Sample Locations

Collection of the underpier core at station SC39 was abandoned due to access issues, presence of debris, and diver safety concerns. The diver encountered significant amounts of unstable debris, steep slopes, horizontal pilings, and unsuitable substrate for sampling. This deviation was approved by USEPA on May 31, 2019.

Based on the modified core acceptance criteria in Section 2.2.3.1, no acceptable cores were collected from stations SC23 and SC40. Station SC23 was abandoned due to penetration of only 1.2 feet, with 1 foot of recovery. Station SC40 was abandoned after two failed attempts to reach the minimum penetration depth.

3 Chemical and Physical Data Quality

The overall data quality assurance (QA)/QC program for the T4 SDU followed procedures outlined in Appendix A to the PDI Work Plan (Anchor QEA 2019a). The data QC criteria were met with a few exceptions (discussed in Section 3.3.3), and the data are acceptable for use as reported or as qualified. Measures taken to ensure data quality employed current USEPA and ASTM protocols. Specific actions included field QA/QC, chain-of-custody procedures, and laboratory data review and validation. Chain of-custody forms and laboratory reports are included in Appendix D. Appendix E provides the supporting QC information and data validation reports.

3.1 Testing Laboratories and Methods

Most of the chemical and physical testing was performed by Apex Laboratories LLC (Apex) in Tigard, Oregon. Vista Analytical Laboratory (Vista) in El Dorado Hills, California, was contracted for high-resolution D/F analysis. Both Apex and Vista are accredited by the Oregon Environmental Laboratory Accreditation Program, which is recognized as an accreditation body under the National Environmental Laboratories Accreditation Program. All chemical and physical testing adhered to the latest updates to SW-846, Third Edition of *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (USEPA 1986) and the most recent updates as they apply to QA/QC procedures and to USEPA method protocols.

3.2 Data Quality Objectives

The analytical testing suite included the parameters listed in Tables 6a and 6b of the PDI Work Plan Addendum No. 1. In addition to these chemical parameters, certain conventional parameters (i.e., grain size, total solids, and TOC) were also analyzed. Grain size and total solids data were collected to provide sediment characteristics for future consideration, total solids results were used to dry-weight correct the sediment data, and TOC was collected to allow for organic carbon normalization of specific parameters, as appropriate.

3.3 Quality Assurance/Quality Control Findings

This section describes the laboratory and field QC procedures that were followed to ensure data are of known and acceptable precision and accuracy so project objectives are achieved. These procedures included analytical and field QC requirements.

3.3.1 Field QA/QC

Field QC samples included field equipment blanks and field duplicates that were analyzed to identify field sample heterogeneity and cross-contamination issues, resulting from sample collection or sample processing in the field. All field QC samples were documented in the field forms and verified by the project QA manager or designee.

The chain-of-custody forms were signed by Apex and Vista at the time of sample receipt. Samples were received in good condition, and cooler temperatures met validation criteria.

3.3.1.1 Field Equipment Blanks

At least one rinsate blank per sample collection method (surface and subsurface sampling) was collected. No chlorinated pesticides or PAHs were detected in the rinsate blanks. PCB congeners were detected at low levels in the rinsate blanks, but associated sediment total PCB concentrations were significantly greater than the total PCB concentration in the blanks. One D/F congener (octachlorodibenzo-p-dioxin) was detected in one of the rinsate blanks, but associated sediment sample results were significantly higher than the concentration in the blank.

3.3.1.2 Field Duplicates

Field duplicates were collected at a frequency of 5% or more except for chlorinated pesticides, which were collected less frequently due to a lack of sample mass within the core interval that was submitted for analysis. Precision was evaluated based on laboratory duplicate and blank spike duplicate relative percent difference values.

3.3.2 Laboratory QA/QC

In accordance with the PDI Work Plan, laboratory QC samples included method blanks, laboratory control samples and ongoing precision and recovery samples, matrix spikes and matrix spike duplicates (as applicable to the method), surrogate spikes, laboratory duplicates, instrument performance checks, and calibration standards. Results of the QC samples were used during data validation to evaluate data quality and apply validation qualifiers as described in Section 3.3.3.

3.3.3 Data Validation

All chemical and physical data submitted in this report were validated by Laboratory Data Consultants, Inc., of Carlsbad, California. Data validations were performed at 90% Stage 2B and 10% Stage 4 (USEPA 2009). Data validation reports are provided in Appendix E. Samples are listed with their corresponding laboratory data package and validation report number in Appendix D, Table D-1. The data validation was performed under USEPA guidelines, as described in the SQAPP and the National Functional Guidelines for Data Review (USEPA 2017b, 2017c).

Data validation verified the accuracy and precision of chemical and physical determinations performed during this investigation. Data qualifiers assigned as a result of the data validation and their definitions are shown on each of the respective analytical results tables. Data may have been qualified as biased or estimated for an analysis based on method or technical criteria. Data qualified with a "J" indicates that the associated numerical value is an estimated concentration of the analyte. Data qualified with a "UJ" indicates the estimated reporting limit (RL) below which the analyte was not detected. All data were determined to be useable as reported from the laboratory or as qualified

in the validation report. No data were rejected as a result of validation, and data completeness was 100%.

Approximately 7% of D/F results were flagged as an estimated maximum possible concentration (EMPC) by the laboratory. The EMPC qualifier is applied to a result when a peak is detected but did not meet all the method criteria. In other words, the instrument detected a peak that is similar to the target compound but did not meet all of the method criteria to be identified as that compound. However, if it is that compound, the reported result is the maximum possible concentration it could be. During validation, all EMPC qualifiers were changed to "J" qualifiers, which indicate detected concentrations that are estimated, using USEPA national validation guidance (USEPA 2016a).

For D/F, there was one EMPC-qualified result for 1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD) at location SG08. The result was a detection above the estimated detection limit (EDL) and below the RL at 0.000900 micrograms per kilogram ($\mu\text{g}/\text{kg}$), which is less than 1/10th of a part per trillion above the RAL of 0.00081 $\mu\text{g}/\text{kg}$. USEPA Region 10 validation guidance (USEPA 2014) allows EMPC qualified results below the RL to be treated as non-detects, but the most recent USEPA guidance (USEPA 2016a), which uses the more conservative approach of treating all EMPC qualified data as detected concentrations, was used for this PDI. The remaining "J" qualified PeCDD results with RAL exceedances at locations SG51, SG59, SG60, and SG61 were flagged by the laboratory due to low-level detections above the EDL and below the RL. The RL is the lowest concentration that can be quantified within certain limits of accuracy and precision, and any detections below the RL are considered estimated. Overall, 34% of D/F data were qualified with a "J" by the laboratory to indicate an estimated, low-level detection below the RL.

RLs and EDLs were below the RALs and ROD cleanup levels (CULs) for PCBs and PAHs. Some D/F EDLs were elevated due to matrix interference, which the laboratory was unable to resolve due to high concentrations of non-target congeners. In addition, some pesticide RLs (i.e., dieldrin, aldrin, and lindane) were above the CULs. Because the objective of this sampling was to refine the SMAs, no further analysis is planned at this time, but future sediment evaluations at T4 may include high-resolution pesticide analysis.

In a few instances, D/F EDLs were above the RALs due to matrix interference (all were less than 1.4 times the RALs). Samples in which a non-detected D/F concentration reported at the EDL exceeded a RAL include the following:

- The EDL for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in one open-water surface sediment sample in the Slip 1 subarea (SG61) had a RAL exceedance factor of 1.3.
- The EDL for TCDD in two subsurface sediment samples collected in the Wheeler Bay subarea (SC28 at 9 to 10.1 feet and SC-29 at 1 to 3 feet) had RAL exceedance factors of 1.0 and 1.4,

respectively. In addition, the EDL for PeCDD in the Wheeler Bay subarea at location SC29 (1 to 3 feet) had a RAL exceedance factor of 1.2.

Samples in which a non-detected concentration reported at the EDL exceeded a CUL include the following:

- The non-detected concentration reported at the EDL for TCDD was above the CUL in the following:
 - Two open-water surface sediment samples in the Slip 3 subarea (SG08 and SG13)—CUL exceedance factors of 1.2 and 1.5, respectively
 - Two open-water surface sediment samples in the Wheeler Bay subarea (SG28 and SG29)—CUL exceedance factors of 1.3 and 1.2, respectively
 - Five open-water surface sediment samples in the Slip 1 subarea (SG47, SG54, SG58, SG59, and SG61)—CUL exceedance factors of 1.1, 1.1, 1.7, 2.7, and 3.9, respectively
 - One underpier surface sediment sample in the Slip 1 subarea (SG41)—CUL exceedance factor of 1.1
 - Four subsurface sediment samples in the Slip 3 subarea:
 - SC12 (1 to 3 feet)—CUL exceedance factor of 1.8
 - SC13 (1 to 3 feet and 5 to 7 feet)—CUL exceedance factors of 1.1 for both intervals
 - SC19 (7 to 9 feet)—CUL exceedance factor of 1.5
 - Four subsurface sediment samples in the Wheeler Bay subarea:
 - SC27 (3 to 5 feet)—CUL exceedance factor of 1.8
 - SC28 (9 to 10.1 feet)—CUL exceedance factor of 3.1
 - SC29 (1 to 3 feet and 5 to 7 feet)—CUL exceedance factors of 4.2 and 2.7, respectively
- The non-detected concentration reported at the EDL for PeCDD was above the CUL in the following:
 - Two open-water surface sediment samples in the Slip 3 subarea (SG13 and SG14)—CUL exceedance factors of 1.6 and 1.0, respectively
 - Two open-water surface sediment samples in the Wheeler Bay subarea (SG29 and SG31)—CUL exceedance factors of 2.0 and 1.6, respectively
 - Four open-water surface sediment samples in the Slip 1 subareas (SG37, SG54, SG58, SG63)—CUL exceedance factors of 1.4, 1.4, 2.3, and 1.5, respectively
 - One underpier surface sediment sample in the Slip 3 subarea (SG23)—CUL exceedance factor of 1.2
 - Six subsurface sediment samples in the Slip 3 subarea
 - SC13 (5 to 7 feet and 9 to 11.1 feet)—CUL exceedance factors of 1.2 and 1.4, respectively

- SC19 (1 to 3 feet, 3 to 5 feet, 7 to 9 feet, and 11 to 11.8 feet)—CUL exceedance factors of 1.3, 1.1, 1.2 and 1.3, respectively
 - Two subsurface sediment samples in the Wheeler Bay subarea
 - SC29 (1 to 3 feet and 5 to 7 feet)—CUL exceedance factors of 4.8 and 2.7, respectively
- The non-detected concentration reported at the EDL for 2,3,7,8-tetrachlorodibenzofuran (TCDF) was above the CUL in one open-water surface sediment sample in the Slip 1 subarea at location SG58 (CUL exceedance factor of 1.1) and one open-water subsurface sample in the Wheeler Bay subarea at location SC29 (1 to 3 feet; CUL exceedance factor of 1.7).
- The non-detected concentration reported at the EDL for 2,3,4,7,8-pentachlorodibenzofuran (PeCDF) was above the CUL in two open-water surface sediment samples in the Slip 1 subarea at locations SG50 (CUL exceedance factor of 1.1) and SG58 (CUL exceedance factor of 1.9), one open-water surface sediment sample in the Wheeler Bay subarea at location SG31 (CUL exceedance factor of 1.7), and one open-water subsurface sample in the Wheeler Bay subarea at location SC29 (5 to 7 feet; CUL exceedance factor of 1.8).

4 Surface Sediment Testing

Surface sediment sampling was performed throughout the ROD SMAs and in adjacent underpier areas to replace outdated surface sediment data and to address locations where the lateral extent of contamination by T4 focused COCs required further refinement. A summary of surface sediment PDI analytical testing results is presented in this section for each of the five site subareas (Figure 1-1).

Within each subarea, data are presented for each of the following site-specific focused COCs, which were used by USEPA, together with harbor-wide COCs (see the list in the following paragraph), to define the preliminary SMA boundaries in the ROD:

- Total PAHs
- PCBs

Data are also presented in this PDI Summary Report for the following additional harbor-wide COCs with available RALs and relevant PTW thresholds, if exceeded:

- D/F (specifically TCDD, PeCDD, PeCDF, 1,2,3,4,7,8-hexachlorodibenzofuran [HxCDF], and TCDF)
- DDx

Data were screened against RALs and PTW thresholds from the ROD (USEPA 2017a), as presented in Tables 4-1a and 4-1b and Figures 4-1 through 4-3e, as applicable. The RALs and PTW thresholds used for screening total PAH and total carcinogenic polycyclic aromatic hydrocarbon (cPAH) concentrations are those from USEPA's *Explanation of Significant Differences, Portland Harbor Superfund Site* (ESD; USEPA 2019). Consistent with the USEPA ROD database summing rules (Appendix A of the Portland Harbor Feasibility Study [FS]; USEPA 2016b), parent and field duplicate sample results (where available) were averaged. Summary statistics for each subarea are provided for the PDI dataset in Tables 4-2a through 4-2g. Grain size data for all surface sediment samples are presented in Figure 4-4.

In summary, less than 20% of PDI surface sediment sample locations (11 of the 62) have concentrations that exceed the RAL for one or more harbor-wide COCs. Two additional surface sediment locations, both in Slip 1, have concentrations above the PTW threshold for HxCDF but are nevertheless below all of the RALs for other COCs. The following is a summary of surface sediment results by COC:

- **Total PAHs:** Five sample locations, located in the underpier area of Slip 3 and in the middle of Slip 3 exceeded the RAL for total PAHs. The T4 site median total PAH concentration is 753 µg/kg, and the arithmetic mean is 175,000 µg/kg. The arithmetic mean is biased by a few extreme PAH concentrations in the Slip 3 underpier area.

- **Total PCBs:** Three sample locations had RAL exceedances for total PCBs, with isolated PTW exceedances in the underpier areas of Slip 1 and Slip 3 and one RAL exceedance at the head of Slip 1. The T4 site median and mean for total PCBs are 1.69 and 15.7 µg/kg, respectively.
- **PeCDD:** Four sample locations in Slip 1 and one sample location in Slip 3 exceeded the RAL for PeCDD. The T4 site median and mean for PeCDD are 0.000243 and 0.000388 µg/kg, respectively.
- **PeCDF:** There were no RAL exceedances for PeCDF, which has T4 site median and mean of 0.000701 and 0.00197 µg/kg, respectively.
- **TCDD:** There were no detected RAL exceedances of TCDD in the PDI dataset. However, one sample location at the head of Slip 1 had a slightly elevated detection limit above the RAL. The T4 site median and mean for TCDD are 0.000153 and 0.000204 µg/kg, respectively.

A summary of surface sediment data for each subarea is provided in this section.

4.1 Berth 414 (Upstream of Slip 3)

The Berth 414 subarea, which is located immediately upstream of Slip 3, contains two open-water surface sample locations: SG01 and SG02 (Figure 2-1).

Conventionals: Surface sediment samples from the Berth 414 subarea consist predominantly of sandy silt, with an average of 26% sand, 55.2% silt, and 18.9% clay. Fines (combined silt and clay content) ranged from 70.4% to 77.6%, with a TOC content of 2.3% to 2.5% and total solids content of 42.3% to 43.1%.

PAHs: PAHs were analyzed and detected in both samples. Total PAH concentrations were 1,700 and 6,000 µg/kg, which are both below the RAL (30,000 µg/kg).

PCBs: PCB congeners were also analyzed and detected in both samples. Total PCB congeners concentrations were 0.442 and 0.492 µg/kg, which are well below the PCB RAL (75 µg/kg).

Other COCs: Berth 414 surface samples were not analyzed for D/F or DDx.

4.2 Slip 3

The Slip 3 subarea contains 14 open-water surface sample locations (SG04, SG05, SG06, SG08, SG09, SG10, SG11, SG13, SG14, SG15, SG16, SG17, SG18, and SG20) and six underpier surface sample locations (SG21, SG22, SG23, SG24, SG25, and SG26) (Figure 2-1). Open-water and underpier surface sediment testing results are discussed in Sections 4.2.1 and 4.2.2.

4.2.1 Slip 3 Open-Water Surface Sediment

Conventionals: The open-water surface sediment samples in the Slip 3 subarea were predominantly silty sand with an average of 77.0% sand, 15.5% silt, and 6.0% clay. TOC content ranged from 0.063% to 1.9%, with 45.9% to 75.8% total solids.

PAHs: PAHs were analyzed in all 14 samples. Individual PAH compounds were detected in all samples, with total PAH concentrations ranging from 295 to 150,000 µg/kg. One PDI sample exceeded the RAL (150,000 µg/kg at SG11; Figure 4-1).

PCBs: PCB congeners were analyzed and detected in all 14 samples, with total PCB concentrations ranging from 0.597 to 11.5 µg/kg (Figure 4-2). All total PCB congener levels were below the PCB RAL.

D/Fs: D/Fs were analyzed in 5 of the 14 samples from the Slip 3 subarea (Figures 4-3a through 4-3e). TCDD was not detected in any samples. PeCDD was detected in three of five samples, with concentrations ranging from 0.000305 to 0.0009 µg/kg. The maximum PeCDD concentration (0.0009 µg/kg at SG08) slightly exceeded the RAL (0.0008 µg/kg); this isolated exceedance is located near the head of the slip (Figure 4-3a). PeCDF was detected in four of five samples, with concentrations ranging from 0.000427 to 0.0015 µg/kg, all well below the RAL (0.2 µg/kg). TCDF and HxCDF levels from Slip 3 samples were all below the associated PTW thresholds (0.6 and 0.04 µg/kg, respectively).

Other COCs: Slip 3 open-water samples were not analyzed for DDx.

4.2.2 Slip 3 Underpier Surface Sediment

Conventionals: The six underpier surface sediment samples in the Slip 3 subarea were predominantly silty sand with an average of 83.2% sand, 9.3% silt, and 2.6% clay. TOC content ranged from 0.19% to 4.6%, with 62% to 73.5% total solids.

PAHs: PAHs were analyzed and detected in all six underpier samples. Total PAH concentrations ranged widely from 17,000 µg/kg (at SG22, under Berth 410) to 8,300,000 µg/kg (at SG26, under Berth 411), with concentrations generally increasing toward the eastern, interior part of the pier. Four of the six samples exceeded the RAL, all from Berth 411 locations closest to the head of the slip (Figure 4-1). In addition, the total cPAH concentration from the one underpier sample closest to the head of the slip (1,300,000 µg/kg at SG26) exceeded the PTW threshold.

PCBs: PCB congeners were analyzed and detected in six of six samples, with total PCB congener concentrations ranging from 10 to 243 µg/kg. The maximum concentration was detected at SG26, the underpier sample with the highest PAH concentration, which is located closest to the head of the slip. This sample concentration exceeded both the RAL and PTW thresholds (75 and 200 µg/kg, respectively). All other sample results were below the RAL for PCBs.

D/Fs: In accordance with the PDI Work Plan, only one of the six underpier samples in this subarea (SG23) was analyzed for D/Fs (Figures 4-3a through 4-3e). TCDD and PeCDD were not detected in the sample. PeCDF was detected at a concentration of 0.000739 µg/kg, below the RAL.

Other COCs: Slip 3 underpier samples were not analyzed for DDx.

4.3 Wheeler Bay

The Wheeler Bay subarea contains eight surface sample locations: SG27, SG28, SG29, SG30, SG31, SG32, SG33, and SG34, all in open water (Figure 2-1).

Conventionals: Surface sediment samples in Wheeler Bay were predominantly very sandy silt with an average of 36.2% sand, 48.0% silt, and 15.1% clay. TOC content ranged from 0.08% to 3.4%, with 41.2% to 79% total solids.

PAHs: PAHs were analyzed and detected in all eight samples, with total PAH concentrations ranging from 225 to 11,000 µg/kg (Figure 4-1). All PAH results were below the RAL.

PCBs: PCB congeners were detected in eight of eight samples, with total PCB concentrations ranging from 0.44 to 23.4 µg/kg. All total PCB concentrations in Wheeler Bay surface sediment samples were below the RAL (Figure 4-2).

D/Fs: D/Fs were analyzed in six of eight Wheeler Bay surface sediment samples (Figures 4-3a through 4-3e). TCDD was detected in one of six samples, below the RAL, at a concentration of 0.000239 µg/kg. PeCDD was detected in two of six samples at concentrations of 0.000405 and 0.000729 µg/kg, which were both below the RAL of 0.0008 µg/kg. PeCDF was detected in four of six samples, with concentrations ranging from 0.000406 to 0.00172 µg/kg. All PeCDF results were below the RAL.

Other COCs: Wheeler Bay surface samples were not analyzed for DDx.

4.4 Slip 1

The Slip 1 subarea contains 26 open-water surface sample locations (SG35, SG36, SG37, SG42, SG43, SG44, SG45, SG46, SG47, SG48, SG49, SG50, SG51, SG52, SG53, SG54, SG55, SG56, SG57, SG58, SG59, SG60, SG61, SG62, SG63, and SG64) and three underpier surface sample locations (SG38, SG0, and SG41) (Figure 2-1). Open-water and underpier surface sediment testing results are discussed in Sections 4.4.1 and 4.4.2, respectively.

4.4.1 Slip 1 Open-Water Surface Sediment

Conventionals: The open-water surface sediment samples in the Slip 1 subarea were predominantly sandy silt with an average of 35.5% sand, 44.9% silt, and 18.9% clay, generally becoming finer

grained near the head of the slip, with less than 15% sand. Surface sediments became coarser grained toward the outer, south side of the slip, with silt content decreasing to less than 30%. TOC content ranged from 0.08% to 2.4%, with 31.2% to 97.1% total solids.

PAHs: PAHs were analyzed in all 26 samples. Individual PAH compounds were detected in all 26 open-water samples, with total PAH concentrations ranging from 50.5 to 7,700 µg/kg (Figure 4-1). All PDI open-water sample concentrations were below the RAL.

PCBs: PCB congeners were detected in all 26 samples, with total PCB congener concentrations ranging from 0.262 to 88.7 µg/kg (Figure 4-2). Only one sample (SG61; near the head of the slip) had a total PCB concentration that exceeded the RAL.

D/Fs: D/Fs were analyzed in all 26 samples (Figures 4-3a through 4-3e). TCDD was detected in 3 of 26 samples, with concentrations ranging from 0.000389 to 0.000472 µg/kg. All detected TCDD samples were below the RAL (0.0006 µg/kg). However, detection limits for two non-detect sample results (0.000789 µg/kg at SG61 and 0.000605 µg/kg at SG60) were slightly above the RAL at the head of Slip 1 (Figure 4-3c). PeCDD was detected in 9 of 26 samples, with concentrations ranging from 0.000198 to 0.00147 µg/kg. Four of the samples exceeded the PeCDD RAL, with a maximum RAL exceedance factor of 1.8. PeCDF was detected in 19 of 26 samples, with concentrations ranging from 0.000277 to 0.0113 µg/kg; no results exceeded the PeCDF RAL. Two surface sediment concentrations exceeded the HxCDF PTW threshold in open-water areas of Slip 1: SG37 (0.0456 µg/kg) and SG47 (0.0401 µg/kg) (Figure 4-3d). See Section 3.3.3 for further discussion of the uncertainties associated with dioxin quantitation near the detection limit.

Other COCs: Slip 1 open-water samples were not analyzed for DDx.

4.4.2 Slip 1 Underpier Surface Sediment

Conventionals: The four underpier surface sediment samples in the Slip 1 subarea were predominantly silty sand with an average of 79.5% sand, 14.8% silt, and 4.5% clay. TOC content ranged from 0.038% to 0.3%, with 67.5% to 73% total solids.

PAHs: PAHs were detected in all three underpier sample locations, with total PAH concentrations ranging from 51.8 to 1,300 µg/kg (Figure 4-1). All PAH concentrations were below the RAL.

PCBs: PCB congeners were detected in all three samples, with total PCB concentrations ranging from 0.177 to 303 µg/kg. The sample from SG41, located at the head of the slip, exceeded both the PCB RAL and PTW threshold (Figure 4-2). All other samples were below the RAL.

D/Fs: D/Fs were analyzed in all three samples (Figures 4-3a through 4-3e). TCDD was not detected in any of the samples. PeCDD was detected in one of three samples, with a concentration of

0.000156 µg/kg, which is below the RAL. PeCDF was detected in all three samples, with concentrations ranging from 0.00122 to 0.0105 µg/kg; all were below the RAL.

Other COCs: Slip 1 underpier samples were not analyzed for DDX.

4.5 Berth 401 (Downstream of Slip 1)

The Berth 401 subarea, which is located immediately downstream of Slip 1, contains three surface sample locations: SG66, SG67, and SG68 (Figure 2-1).

Conventionals: Surface sediment samples from this subarea are predominantly very silty sand with an average of 66.1% sand, 23.5% silt, and 8.3% clay. TOC content ranged from 0.058% to 2.2%, with 41.1% to 77.5% total solids.

PAHs: PAHs were detected in all three samples. Total PAH concentrations ranged from 54.5 to 478 µg/kg, and all were below the RAL (Figure 4-1).

PCBs: PCB congeners were detected in all three samples. Total PCB congener concentrations ranged from 0.180 to 20.5 µg/kg; all were below the RAL (Figure 4-2).

D/Fs: All three Berth 401 subarea samples were analyzed for D/Fs (Figures 4-3a through 4-3e). TCDD was detected in one of three samples at a concentration below the RAL of 0.000353 µg/kg. PeCDD was detected in all three samples, with concentrations ranging from 0.000254 to 0.000713 µg/kg, all below the RAL. PeCDF was detected in two of three samples, at concentrations of 0.000447 and 0.000879 µg/kg; no PeCDF results exceeded the RAL.

Other COCs: Berth 401 samples were not analyzed for DDX.

5 Subsurface Sediment Testing

Subsurface sediment sampling was performed to address locations within the ROD SMA where the vertical extent of contamination by T4 focused COCs was not fully defined. A summary of subsurface sediment PDI analytical testing results is presented in this section for each of the five site subareas (Figure 1-1).

Subsurface sediment sampling and analysis focused on addressing the following specific data gaps, as detailed in the PDI Work Plan:

- One core in the Berth 414 area to verify the vertical extent of DDx contamination
- Four cores at the head of Slip 3 to verify the vertical extent of PAH and PCB contamination
- Six cores in underpier areas of Slip 3 to assess subsurface conditions
- Four cores in the southeast corner of Wheeler Bay to bound the vertical extent of PAHs and verify the vertical extent of PCBs and D/F
- One core in western Wheeler Bay (near the navigation channel) to investigate the vertical extent of PCBs and DDx
- Six cores in Slip 1 to verify the extent of PCB PTW
- Four cores in underpier areas of Slip 1 to assess subsurface conditions
- One core in the Berth 401 area to verify the vertical extent of PCBs

Subsurface data were screened against RALs and PTW thresholds, as presented in Tables 5-1a and 5-1b and in Figures 5-1 through 5-4e, as applicable. Summary statistics for analytical parameters by subarea are compiled in Tables 5-2a to 5-2f. Consistent with the USEPA ROD database summing rules (Appendix A of the Portland Harbor FS; USEPA 2016b), parent and field duplicate sample results (where available) were averaged. A summary of subsurface sediment data for each subarea is provided in this section.

5.1 Berth 414 (Upstream of Slip 3)

The Berth 414 subarea contains one subsurface location: SC03 (Figure 2-2). The purpose of testing at SC03 was to bound the vertical extent of DDx, which was previously detected above the RAL in the 1- to 2-foot sample interval in a previously collected core at this location (PI-09). The top two intervals of this core (1 to 3 feet and 3 to 5 feet) were analyzed for grain size, total solids, TOC, PAHs, and chlorinated pesticides.

Conventionals: The fines content (combined silts and clays) in subsurface samples was 60% in the uppermost interval (1 to 3 feet) and 39% in the 3- to 5-foot interval, with an overall average of 47.9% sand, 36.2% silt, and 13.3% clay across the two intervals (Figure 5-5). TOC content from the two samples was 1.7% and 2.0%, with 60.7% and 68.9% total solids, respectively.

PAHs: PAHs were analyzed in both sample intervals from SC03. Total PAH concentrations were 9,700 µg/kg in the 1- to 3-foot depth interval and 38,000 µg/kg in the 3- to 5-foot depth interval (Figure 5-1). The 3- to 5-foot sample interval exceeded the RAL and is vertically unbounded at this location.

Chlorinated Pesticides: Select chlorinated pesticides were analyzed in both subsurface samples from SC03. Four of the nine pesticide compounds analyzed were detected: 2,4'-DDD (in one sample), 4,4'-DDD (in both samples), 4,4'-DDE (in both samples), and 4,4'-DDT (in both samples). Total DDX concentrations for the 1- to 3-foot and 3- to 5-foot depth intervals were 42.3 and 109 µg/kg, respectively. Both sample concentrations are below the RAL (Figure 5-3).

Other COCs: Berth 414 subsurface samples were not analyzed for PCBs or D/F.

5.2 Slip 3

The Slip 3 subarea contains four open-water subsurface sampling locations (SC12, SC13, SC18, and SC19) and six underpier subsurface sampling locations (SC21, SC22, SC23, SC24, SC25, and SC26) (Figure 2-2). Only three of the underpier locations were triggered for analysis based on surface sediment results (SC24, SC25, and SC26; all in Slip 3), as described in Section 5.2.2.

5.2.1 Slip 3 Open-Water Subsurface Sediment

There were 21 subsurface samples analyzed from four cores at the head of Slip 3 to verify the vertical extent of PAH, PCB, and D/F concentrations (Figures 5-1, 5-2, and 5-4a through 5-4e).

Conventionals: Fines content in the open-water subsurface samples ranged from 3.3% to 87%. In general, sand content increased, and percent fines decreased with sample depth, with an overall average of 51.1% sand, 36.8% silt, and 10.2% clay (Figure 5-5). TOC content ranged from 0.028% to 2.0%, with 57.2% to 83.6% total solids.

PAHs: PAHs were detected in 9 of the 21 analyses of open-water subsurface samples. Total PAH concentrations ranged from 39.7 to 300,000 µg/kg. There were five samples from two locations with concentrations that exceeded the RAL: three at station SC12 (at 1 to 3 feet, 3 to 5 feet, and 5 to 7 feet) and two at station SC13 (at 1 to 3 feet and 3 to 5 feet). In each these, total PAH exceedances were bounded by deeper samples with concentrations below the RAL.

PCBs: PCB Aroclors were detected in 7 of the 21 analyses of open-water subsurface samples. Total PCB Aroclor concentrations ranged from 19.7 to 87.8 µg/kg. The 3- to 5-foot sample interval at station SC13 had a total PCB concentration that exceeded the RAL; however, PCBs were non-detect (less than 5.25 µg/kg) in the underlying 5- to 7-foot interval.

D/Fs: D/Fs were detected in all 15 analyses of open-water subsurface samples collected from three cores at the head of Slip 3 (SC19, SC12, and SC13; Figure 2-2). All analyzed D/Fs were detected, with at least two congeners detected in each sample. RAL exceedances occurred for two congeners: PeCDD and TCDD. These exceedances occurred in the 1- to 3-foot, 3- to 5-foot, and 5- to 7-foot depth intervals at station SC12 and in the 3- to 5-foot depth interval at station SC13 (Figures 5-4a and 5-4c). Deeper samples in SC12 and SC13 were non-detect.

Other COCs: Slip 3 open-water subsurface samples were not analyzed for DDx.

5.2.2 Slip 3 Underpier Subsurface Sediment

There were six subsurface samples analyzed from three underpier cores in Slip 3 (SC24 [1 to 2 feet and 2 to 2.2 feet], SC25 [1 to 2 feet and 2 to 2.21 feet], and SC26 [1 to 2 feet and 2 to 2.27 feet]) (Figure 2-2), with select analyses performed to assess subsurface conditions and characterize the extent of PAH and PCB contamination (Figures 5-1 and 5-2).

Conventionals: TOC content in the underpier subsurface samples ranged from 0.54% to 5.9%, with 56.1% to 77.7% total solids. Grain size was not analyzed in these samples due to sample volume limitations.

PAHs: PAHs were detected in all six of the analyzed underpier subsurface samples from the three cores. Total PAH concentrations ranged from 270,000 µg/kg (at SC26; 2 to 2.3 feet) to 9,100,000 µg/kg (at SC26, 1 to 2 feet). All six total PAH concentrations exceeded the RAL.

PCBs: PCB Aroclors were analyzed in both of the underpier subsurface samples from SC26 (1 to 2 and 2 to 2.3 feet). Total PCB Aroclors concentrations ranged from 34.3 µg/kg (in the 1- to 2-foot depth interval) to 340 µg/kg (in the 2- to 2.3-foot depth interval). The total PCB concentration in the 1- to 2-foot sample interval was below the RAL, and the 2- to 2.3-foot sample interval exceeded the RAL.

Other COCs: Slip 3 underpier subsurface samples were not analyzed for DDx or D/F. At the request of USEPA, the Port is performing D/F testing of available archived core samples from underpier core locations SC24, SC25, and SC26. These data will be compiled and reported in an addendum to this PDI Summary Report.

Consistent with the USEPA-approved PDI Work Plan, underpier sediment cores were collected to the maximum depth practicable (i.e., based on access, the depth of soft sediment that has accumulated on these riprap slopes, and equipment limitations). As such, refusal in this area (typically at depths less than 3 feet) was associated with the presence of shoreline armoring/riprap, which likely represents the vertical extent of contamination (i.e., of PAHs and PCBs) in these areas. Based on the proposed technology assignments, alternative underpier sampling and evaluation approaches, if

warranted, will be discussed in the BODR. Additional discussion of the physical characteristics, chemical data collected, and other relevant aspects such as as-built plans for structures in the underpier areas will also be provided in the BODR to inform the overall CSM and ultimately the design.

5.3 Wheeler Bay

The Wheeler Bay subarea contains five subsurface locations, with four stations nearshore (SC27, SC28, SC29, and SC30) and one location just outside of the navigation channel (SC32) (Figure 2-2). Twelve subsurface samples from Wheeler Bay were analyzed to delineate the vertical extent of PAHs, PCBs, DDx, and D/F (Figures 5-1 to 5-4e).

Conventionals: Fines content in subsurface samples ranged from 39% to 91% (Figure 5-5). In general, sand content and percent fines were relatively consistent with depth and averaged 17% sand, 62.8% silt, and 20.1% clay. TOC content ranged from 0.61% to 2.4%, with 47.8% to 66.7% total solids.

PAHs: PAHs were detected in all nine analyses of subsurface samples. Total PAH concentrations in the samples ranged between 1,750 and 25,000 µg/kg. Three samples at three locations had concentrations that exceeded the ROD RAL (SC27 at 3 to 5 feet; SC29 at 3 to 5 feet; and SC30 at 1 to 3 feet). All samples were below the RAL. Each of the samples with RAL exceedances in Wheeler Bay had underlying samples with total PAH concentrations below the RAL, thus bounding the depth of impacts.

PCBs: PCB Aroclors were detected in all 10 analyses of subsurface samples. Total PCB Aroclors concentrations ranged from 27.7 µg/kg (SC30 at 5 to 7 feet) to 73.9 µg/kg (SC27 at 5 to 7 feet). All samples were below the RAL.

D/Fs: D/Fs were detected in all 12 subsurface samples from four core locations at Wheeler Bay (SC27, SC28, SC29, and SC30; Figure 2-2). All D/F congeners were detected, and at least nine congeners were detected in each sample. Two congeners exceeded their respective RALs: PeCDD and TCDD. These exceedances of detected concentrations occurred in the following samples (Figures 5-4a and 5-4c):

- SC27, 3- to 5-foot and 5- to 7-foot depth interval
- SC28, 7- to 9-foot and 9- to 10.1-foot depth interval
- SC30, 3- to 5-foot depth interval

Additionally, several elevated *non-detect* values were above the RAL:

- TCDD and PeCDD in the 1- to 3-foot depth interval at SC29
- TCDD in the 9- to 10.1-foot depth interval at SC28

Deeper samples with non-detect D/F concentrations vertically bound the RAL exceedances at station SC30. RAL exceedances are not vertically bounded by deeper samples at stations SC27 and SC28.

D/F RAL exceedances are not vertically bounded for the following PDI core locations in Wheeler Bay:

- SC27, for PeCDD and TCDD (below 7 feet)
- SC28, for PeCDD (below 10.1 feet)

Chlorinated Pesticides: Pesticides were analyzed in the 1- to 3-foot depth interval of core SC32 (Figure 2-2). None of the nine pesticide compounds analyzed, including DDx compounds, were detected (Figure 5-3).

5.4 Slip 1

The Slip 1 subarea contains six open-water subsurface locations (SC42, SC43, SC44, SC45, SC46, and SC47) and two underpier subsurface sampling locations (SC38 and SC41) (Figure 2-2). Four subsurface samples from two stations (SC43 and SC47) were analyzed to verify the extent of PCB PTW and potential D/F impacts (Figures 5-2 and 5-4a to 5-4e). The underpier subsurface samples from Slip 1 were not triggered for analysis.

Conventionals: Fines content in subsurface samples ranged from 1.8% to 72%, with an average of 68% sand, 22% silt, and 9.6% clay (Figure 5-5). TOC content ranged from 0.023% to 2.3%, with 55% to 84% total solids.

PCBs: PCB Aroclors were analyzed in the top two subsurface intervals at SC43 (1- to 3-foot and 3- to 5-foot depth intervals). The total PCB Aroclor concentration for the 1- to 3-foot depth interval was 32.4 µg/kg (i.e., well below the RAL), and the results for the 3- to 5-foot depth interval were all non-detect.

D/Fs: D/Fs were analyzed in the top two subsurface depth intervals (1 to 3 and 3 to 5 feet) at SC47 (Figure 2-2). PeCDD and TCDD were detected in both samples at concentrations exceeding the RAL (Figures 5-4a and 5-4c). Both PeCDD and TCDD are vertically unbounded at SC47. At SC47, a HxCDF PTW threshold exceedance was detected at a concentration of 0.043 µg/kg in the 1- to 3-foot depth interval but is vertically bounded by a HxCDF concentration below the PTW threshold (0.0347 µg/kg) in the 3- to 5-foot depth interval (Figure 5-4d) at this location.

Other COCs: Slip 1 subsurface samples were not analyzed for PAHs or DDx.

5.5 Berth 401 (Downstream of Slip 1)

The Berth 401 subarea, which is located downstream of Slip 1, contains one subsurface sample location behind Berth 401: SC67 (Figure 2-2).

Conventionals: The fines content in the subsurface sample (collected from 1 to 3 feet) was 1.8%, the TOC content was 0.06%, and the total solids was 82.8% for the single analyzed interval, with 95% sand, 1.4% silt, and 0.4% clay (Figure 5-5).

PCBs: PCB Aroclors were analyzed in the 1- to 3-foot depth interval. The total PCB Aroclors concentration was non-detect and below the RAL.

Other COCs: Berth 401 subsurface samples were not analyzed for PAHs, D/F, or DDx.

6 Objectives of the PDI and Surface SMA Delineation

The objective of the PDI for the T4 SDU was the collection of additional sediment data to fill data gaps associated with horizontal and vertical SMA delineation, consistent with the ROD. As described in Sections 6.1 through 6.3, the 2019 PDI dataset, together with the 2018 Pre-RD Group data and recent (2015 and 2017) post-maintenance dredging data at the T4 SDU, are sufficient to fill the data gaps identified in the PDI Work Plan. Vertical SMA delineation and additional data needs for the 30% RD will be evaluated in the BODR. As detailed in USEPA's *Remedial Design Guidelines and Considerations* (USEPA 2020), SMAs will be delineated by surface and subsurface contamination above RALs and where exposure to aquatic receptors is occurring or has the potential to occur.

6.1 Pre-RD Group Data

Surface and subsurface sediment data were collected by the Pre-RD Group in 2018 (AECOM and Geosyntec 2019) throughout Portland Harbor. That sampling event included 24 surface sediment locations and two subsurface sediment core locations within the T4 SDU (Figures 2-1 and 2-2, respectively). Results of the Pre-RD Group sampling are presented in the *PDI Evaluation Report* (AECOM and Geosyntec 2019) and are summarized in this section. For completeness, the Pre-RD Group data are combined with PDI data in Figures 6-1a to 6-1g and 6-2a to 6-2h to support SMA delineation using surface sediment data.

6.1.1 Surface Sediment Data within the T4 SDU

Surface sediment data collected by the Pre-RD Group within the T4 SDU are summarized in this section for the T4 focused COCs and additional chemicals with PTW thresholds. Results are shown in Figures 6-1a to 6-1g. Note that three surface sediment samples from the Pre-RD Group dataset within Slip 3 were collected slightly deeper than 30 cm (i.e., 31 to 32 cm), which does not substantively affect sample representativeness. The Pre-RD Group surface sediment dataset is described as follows:

- **Conventionals:** The average TOC content of Pre-RD Group surface sediment samples was 2%, and the average total solids content was 49%. Similar to the findings of the PDI, surface sediment samples from the Pre-RD Group study were predominantly silt (up to 60% silt) in Wheeler Bay and Slip 1 and predominantly fine to medium sand (typically 80% sand) in Slip 3. The average grain size distribution for all Pre-RD surface sediment samples was 39% sand, 47% silt, and 9% clay.
- **PAHs:** One Pre-RD Group surface sediment sample concentration exceeded the RAL. The RAL exceedance is located within Slip 3 (72,300 µg/kg at B117; Figure 6-1a).
- **PCBs:** No Pre-RD Group surface sediment concentrations exceeded the PCB RAL or PTW threshold. This includes samples collected near the former PCB PTW area on the southwest bank of Slip 1.

- **DDx:** No Pre-RD Group surface sediment concentrations exceeded the DDx RAL or PTW threshold.
- **PeCDD:** Six Pre-RD Group surface sediment sample concentrations in Slip 1 exceeded the PeCDD RAL. Concentrations exceeding the RAL range between 0.0011 and 0.0029 µg/kg. No concentrations exceeded the PTW threshold. Each of the exceedances are "J" qualified as estimated values near the detection limit. Further discussion of the uncertainties associated with high-resolution D/F quantitation near the detection limit is provided in Section 3.3.3.
- **PeCDF:** No Pre-RD Group surface sediment concentrations exceeded the PeCDF RAL or PTW threshold.
- **TCDD:** Five Pre-RD group surface sediment samples in Slip 1 had concentrations that exceeded the TCDD RAL. Concentrations exceeding the RAL range between 0.00066 and 0.0041 µg/kg. No concentrations exceeded the PTW threshold. Except for the 0.0041 µg/kg concentration, the other exceedances are "J" qualified as estimated.
- **HxCDF:** Five Pre-RD group surface sediment samples had concentrations that exceeded the HxCDF PTW threshold of 0.04 µg/kg. The highest exceedance of 0.35 µg/kg is located downstream of Slip 1 at Berth 401. The remaining exceedances, all in Slip 1, are between 0.0401 µg/kg and 0.089 µg/kg.

6.1.2 Subsurface Sediment Data within the T4 SDU

Subsurface sediment data collected by the Pre-RD Group within the T4 SDU are summarized in this section for the T4 focused COCs, plus DDx and D/F. Two subsurface cores were collected within the T4 SDU: one in Wheeler Bay and one in the southeast corner of Slip 3 (Figure 2-2). PCB, DDx, and PeCDF RALs were not exceeded in any of the core intervals. Specific RAL exceedances are summarized as follows and are shown in Figures 6-2a through 6-2h:

- SC-S055 in Wheeler Bay
 - TOC ranged from 1.5 to 2.6%, and total solids ranged from 52% to 68%. Samples were predominantly silt (52% to 66%) with a sand content that increased with depth from 20% in the top 2 feet to 39% in the 6 to 8-foot depth interval. All samples had less than 15% clay.
 - Total PAH concentrations exceeded the RAL in the 0- to 2-foot (76,000 µg/kg) and 2- to 4-foot (242,000 µg/kg) intervals. However, the depth of RAL contamination was bounded by deeper samples (i.e., at 4 to 6 feet and 6 to 8 feet) below the RAL.
 - TCDD and PeCDD concentrations exceeded the RALs in the 2- to 4-foot, 4- to 6-foot, and 6- to 8-foot intervals. TCDD concentrations exceeding RALs ranged between 0.00065 and 0.0014 µg/kg. PeCDD concentrations exceeding RALs ranged between 0.0012 and 0.0023 µg/kg.
 - No samples deeper than 8 feet were analyzed by the Pre-RD group.

- Based on the above Pre-RD Group D/F results, samples from the 7- to 9-foot and 9- to 10.1-foot depth intervals of co-located PDI subsurface core, SC28, were collected and analyzed for D/F (Figures 6-2d through 6-2h). The depth of TCDD contamination is bounded by a sample below the RAL in the 7- to 9-foot interval. However, PeCDD results exceed the RAL in both of the deeper intervals.
- SC-S061 in the southeast corner of Slip 3
 - TOC ranged from 0.23% (top 3 feet) to 2.7% (3 to 4.5 feet), and total solids ranged from 61% to 82%. Samples in the top 4.5 feet were predominantly sand (55% to 90%) with 3% to 36% silt and minor clay. The 4.5- to 6-foot sample interval was finer grained, with 59% silt, 34% sand, and 7% clay.
 - The total PAH concentration exceeded the RAL in the 3- to 4.5-foot interval (221,000 µg/kg). This exceedance was bounded by a deeper sample (4.5 to 6 feet) below the RAL.
 - The total PeCDD concentration (0.0017 µg/kg) exceeded the RAL in the 3- to 4.5-foot interval. However, samples analyzed from the 4.5- to 6-foot interval were below the RALs for all chemicals analyzed.

6.2 Objectives of the PDI

The objective of the PDI for the T4 SDU was the collection of additional sediment data to fill data gaps associated with horizontal and vertical SMA delineation, consistent with the ROD. These two objectives are further discussed in Sections 6.2.1 and 6.2.2.

6.2.1 *Horizontal Extent of Contamination*

Surface sediment sampling was performed throughout the ROD SMA and in adjacent underpier areas to replace outdated surface sediment data and to address locations where the lateral extent of contamination by T4 focused COCs required further refinement. To address this data gap, 62 surface sediment samples were collected at approximately 150-foot centers and analyzed for PAHs, PCBs, and selectively for D/F, in accordance with the PDI Work Plan. The 2019 PDI dataset, together with the 2018 Pre-RD Group data and recent (2015 and 2017) post-maintenance dredging data at the T4 SDU, are sufficient to complete the BODR. In accordance with the data replacement evaluation approach discussed with USEPA (see Appendix F and Section 6.3.1), historical sample data from underpier areas were evaluated for use in SMA delineation on a case-by-case basis considering the age and quality of the historical data, local sedimentation (and erosion) rates, and the availability and proximity of more recent PDI samples. Based on that evaluation, no historical side-slope data were considered appropriate for use in delineating the surface SMA. Surface sediment concentrations of T4 focused COCs are horizontally bounded, and the objective of the surface sediment PDI was successfully completed. The sufficiency of data in underpier areas, in light of the technology assignments for these areas, will be further evaluated in the BODR.

6.2.2 Vertical Extent of Contamination

Subsurface sediment sampling was performed to address locations within the ROD SMA where the vertical extent sediment exceeding RALs was not fully defined.

Subsurface sediment sampling and analysis focused on addressing the following specific data gaps, as detailed in the PDI Work Plan:

- **One Core in the Berth 414 Area to Verify the Vertical Extent of DDx:** As discussed in the USEPA-approved PDI Work Plan, subsurface core SC03 was collected "to verify the occurrence and depth of DDx impacts in this area." There are only two samples in the entire T4 project area (both subsurface) that exceed the RAL for DDx. There are no RAL exceedances of DDx in surface sediment in the ROD dataset or the Pre-RD Group data, and DDx is not a COC at T4. The DDx impacts identified in PI-09 (concentration of 430 µg/kg, which is above the RAL of 160 µg/kg in the 1- to 2-foot sample interval; Figure 6-2c) were not replicated by station SC03; total DDx concentrations for the 1- to 3-foot and 3- to 5-foot depth intervals were both below the RAL. Although the deepest analyzed interval from SC03 (3 to 5 feet) exceeded the RAL for total PAH, total PAH results from nearby core B414-01 (sampled during the 2007 Early Action; Anchor Environmental 2007) had no RAL exceedances in any intervals from 0 to 7.5 feet below mudline (Figure 6-2a). As such, there is sufficient information to meet the objective of the PDI sampling program at this location. Because the historical DDx impacts identified in PI-09 were not replicated by PDI station SC03, this sample represented one of only two RAL exceedances of DDx at T4 (the other, at historical location VC-29, was bounded by 10 feet of material below the RAL); there were no RAL exceedances of DDx in surface sediment in the ROD dataset or the Pre RD Group data, and because DDx is not a COC at T4, the historical DDx data will be replaced by the PDI results in this area.
- **Four Cores at the Head of Slip 3 to Verify the Vertical Extent of PAHs, PCBs, and D/F:** In each of the four PDI core locations at the head of Slip 3, total PAH RAL exceedances (where present) were bounded by deeper samples with concentrations below the RAL (Figure 6-2a). The 3- to 5-foot sample interval at station SC13 had a total PCB concentration that exceeded the RAL; however, PCBs were non-detect (less than 5.25 µg/kg) in the underlying 5- to 7-foot interval, thereby bounding the depth of PCB contamination at that location. PCB concentrations were below the RAL in all other samples, including samples collected down to 13.6 feet (at SC18; Figure 6-2b). D/F were analyzed at SC19, SC13, and SC12. Non-detect samples vertically bound D/F RAL exceedances at SC13 (at 3 to 5 feet) and SC12 (at intervals down to 7 feet), and D/Fs were non-detect in all sample intervals from SC19 (Figures 6-2d through 6-2h). As such, the objective of the PDI sampling program has been met at these locations.
- **Six Cores in Underpier Areas of Slip 3 to Assess Subsurface Conditions:** Six subsurface samples from three underpier core locations in Slip 3 (SC24 [1 to 2 feet and 2 to 2.2 feet],

SC25 [1 to 2 feet and 2 to 2.21 feet], and SC26 [1 to 2 feet and 2 to 2.27 feet]) were analyzed for site COCs that exceeded the RAL for total PCBs and/or total PAHs in the co-located underpier surface sediment samples. Coring attempts at SC23 were unsuccessful due to low penetration and recovery. At the request of USEPA, the Port is conducting D/F testing of available archived core samples from SC24, SC25, and SC26. These data will be compiled and reported in an addendum to this PDI Summary Report. Consistent with the USEPA-approved PDI Work Plan, underpier sediment cores were collected to the maximum depth practicable (i.e., based on access, the depth of soft sediment that has accumulated on these riprap slopes, and equipment limitations). As such, refusal in this area (typically at depths less than 3 feet) was associated with the presence of shoreline armoring/riprap, which likely represents the vertical extent of contamination in these areas. Based on the proposed technology assignments, alternative underpier sampling and evaluation approaches, if warranted, will be discussed in the BODR. Additional discussion of the physical characteristics, chemical analytical results, and other relevant data, such as as-built plans for structures in the underpier areas, will be provided in the BODR to inform the overall CSM and ultimately the remedial design for these areas.

- **Four Cores in the Southeast Corner of Wheeler Bay to Bound or Verify the Vertical Extent of PAHs, PCBs, and D/F:** Subsurface samples were collected from four core locations in the interior southeast corner of Wheeler Bay to delineate the vertical extent of PAH, PCB, and D/F contamination (Figures 6-2a, 6-2b and 6-2d through 6-2h). Each of the three PDI samples with total PAH RAL exceedances in Wheeler Bay (all within the top 5 feet of SC27, SC29, and SC30) and one Pre-RD Group sample (SC-S055) were vertically bounded by underlying samples with total PAH concentrations below the RAL (Figure 6-2a). PCBs were below the RAL in all Wheeler Bay samples (Figure 6-2b). RAL exceedances of PeCDD and TCDD at station SC30 (at 3 to 5 feet) are vertically bounded by non-detects. D/F RAL exceedances, primarily PeCDD, are not vertically bounded at stations SC27 (i.e., below 7 feet) and SC28 (i.e., below 10.1 feet). However, because of the low magnitudes of exceedance (1.3 to 2.7 times the RAL), existing cover of overlying material (e.g., 2 or more feet) below the RAL in an overall depositional area, and relative immobility of D/F, sufficient data are available to proceed with development of the BODR, though additional data could be needed in the future based on the selected remedial technology. As such, this objective of the PDI sampling program has been met.
- **One Core in Western Wheeler Bay (Near the Navigation Channel) to Investigate the Vertical Extent of PCBs and DDx:** PCBs and pesticides were analyzed in the 1- to 3-foot depth interval of core SC32 in Wheeler Bay (Figures 6-2b and 6-2c). Pesticides (including DDx) were non-detect, and PCBs were below the RAL. Therefore, this objective of the PDI sampling program has been met.

- **Six Cores in Slip 1 to Verify the Extent of PCB PTW:** Six subsurface cores were collected in Slip 1 to investigate the extent subsurface PCB concentrations at a historical location exceeding the PCB PTW threshold. Surface and subsurface intervals of co-located sampling station SC43 (0 to 1 foot, 1 to 3 feet, and 3 to 5 feet) were all below the PCB RAL; therefore, no other core samples were triggered for PCB analysis. PCB impacts that were previously identified in surface sediments at historical location T4-VC13 were not confirmed in surface or subsurface sediments in this area, and no concentrations were above either the RAL or the PTW threshold. As such, this objective of the PDI sampling program has been met.
- **Four Cores in Underpier Areas of Slip 1 to Assess Subsurface Conditions:** Two of the four proposed underpier cores were completed in Slip 1: SC38 and SC41. Underpier stations SC39 and SC40 were abandoned, with USEPA approval, due to presence of debris, low recovery, and other safety considerations as detailed in Section 2.2.3. Surface sediment results from co-located underpier surface sediment stations SG39 and SG40 were below the ROD RALs for total PAHs and all D/F. Total PCBs concentrations were below the RAL at SG39 but exceeded the RAL and PCB PTW threshold at SG41. Due to the limited depth of recovery at SC41 (1.2 feet; 67%), analysis of the available (archived) core sample (i.e., the 0- to 1-foot depth interval) from this station was not considered necessary for RD because a surface sediment result is already available. Based on the results of PDI underpier surface sediment samples and field observations of sediment depths from coring attempts, sufficient subsurface underpier data are available to meet this objective of the PDI. Consistent with the USEPA-approved PDI Work Plan, underpier sediment cores were collected to the maximum depth practicable (i.e., based on access, the depth of soft sediment that has accumulated on these riprap slopes, and equipment limitations). As such, refusal in this area (typically at depths less than 3 feet) was associated with the presence of shoreline armoring/riprap, which likely represents the vertical extent of (PCB) contamination in this area. Based on the proposed technology assignments, alternative underpier sampling and evaluation approaches, if warranted, will be discussed in the BODR. Additional discussion of the physical characteristics, chemical analytical results, and other relevant data, such as as-built plans for structures in the underpier areas, will be provided in the BODR to inform the overall CSM and ultimately the remedial design for these areas.
- **One Core in the Berth 401 Area to Verify the Vertical Extent of PCBs:** One core (SC67) was collected in the Berth 401 area. PCB Aroclors were analyzed in the 1- to 3-foot depth interval. Total PCBs were non-detect and below the RAL (Figure 6-2b). As such, this objective of the PDI sampling program has been met.

In addition, due to a surface sediment exceedance the HxCDF PTW threshold at station SG47 in Slip 1, D/Fs were triggered for analysis in the top two subsurface depth intervals (1 to 3 feet and 3 to 5 feet) in co-located core SC47 (Figures 6-2d through 6-2h). In the 1- to 3-foot depth interval, the

HxCDF concentration (0.0483 µg/kg) exceeded the PTW threshold. The HxCDF concentration in the 3- to 5-foot depth interval (0.0347 µg/kg) was below the PTW threshold. PeCDD and TCDD were detected in both samples at concentrations exceeding the RAL; other congeners, with the exception of HxCDF, were below the RALs.

6.3 Initial Refinement of SMA Delineation Using Surface Sediment Data

Preliminary ROD SMAs within the T4 SDU have been revised to incorporate the PDI and Pre-RD Group surface sediment datasets. The updated PDI SMAs using surface sediment data are presented in Figures 6-3 and 6-4. These SMAs include those areas where surface sediment data exceed the RAL for T4 focused COCs plus D/F. Consistent with the ROD, the PDI SMAs were interpolated between sample points using the Natural Neighbor method; during RD, more robust interpolation methods are expected to be used. The surface sediment data replacement evaluation is discussed in Section 6.3.1 and Appendix F. Section 6.3.2 discusses other factors that will be considered for further SMA delineation. The PDI SMAs at the T4 SDU represent an initial refinement of the SMAs presented in the ROD based on updated information; further SMA refinement is anticipated to occur during the RD process based on site-specific conditions, including the factors outlined in Section 6.3.2 and an evaluation of subsurface RAL exceedances where exposure to aquatic receptors is occurring or has the potential to occur.

6.3.1 Data Replacement Evaluation

Abundant historical surface sediment data exist for the T4 SDU. However, these existing data are 11 to 22 years old, and due to the prevailing sedimentation rates at T4, these surface sediment samples are no longer representative of current conditions. Specifically, given the typical sedimentation rates in Slip 1, Wheeler Bay, and the south side of Slip 3 (0.1 to 0.25 foot per year), most of these areas will have been covered, mixed with newly deposited sediment, or moved since the historical data were collected, in many cases fully replacing the 30-cm surface sediment layer. The newly deposited sediments have lower concentrations, evidenced by site-wide reductions in average surface sediment concentrations of 83% and 76% for total PAHs and total PCBs, respectively (Appendix F). On the other hand, sediments may have also been removed or redistributed in the navigation lanes of Berths 410 and 411 since the historical data were collected.

A T4 site-specific data replacement evaluation has been developed to support replacement of historical data (USEPA FS dataset 1997 to 2008) with the current data (post-dredge samples at Berth 401 from a 2015 maintenance dredging event, post-dredge samples at Berth 410 from a 2017 maintenance dredging event, 2018 Pre-RD Group data, and 2019 PDI data), as described in Appendix F. Multiple lines of evidence have been considered in this evaluation, including unbiased sampling approach, sampling density, age of the data, deposition versus erosion/scour potential, evidence of natural recovery (including population-based statistical trends and quantitative

pair-comparison tests), heterogeneity of substrate, and presence of outliers. Because most of the PDI data were collected on an unbiased, systematic grid, all of the historical sampling locations in the ROD SMA are within 100 feet of a current sampling location, indicating the PDI dataset provides full and complete coverage to support the BODR.

In addition, historical surface sediment data from T4 were compared with current data to determine if significant changes in sediment quality have occurred over time, in particular, decreases in surface sediment concentrations that would be indicative of natural recovery. The statistical data comparisons were performed as recommended by USEPA in its comments dated February 25, 2020, and clarified in subsequent discussions between USEPA and the Port in April and May 2020. Thiessen polygons were developed using the historical dataset to establish historical-recent data pairs followed by significance testing using the nonparametric Wilcoxon Signed Rank test. The results of the surface sediment pair-comparison tests show statistically significant site-wide decreases in total PAH and total PCB concentrations, as well as in the main subareas of T4. These trends are further corroborated by population-based statistics.

Based on these multiple lines of evidence, for the purpose of SMA delineation, the current surface sediment dataset is a better representation of the current surface sediment conditions in the deep water areas of T4 and is recommended to fully replace the historical data in these areas. Due to its unique characteristics, the appropriate use of historical data in side-slope areas for SMA delineation was further evaluated on a case-by-case basis considering the age and quality of the side-slope data, the prevailing sedimentation (and erosion) rates, and the availability and proximity of more recent PDI samples. Side-slope samples that exhibit more than 1 foot of erosion or deposition since they were collected were excluded from consideration because they are no longer representative of current surface sediment conditions at T4 (Appendix F). The remaining side-slope samples were further evaluated based on their age, data quality, proximity to PDI samples, and influence on the surface SMA (i.e., RAL exceedances). None were considered appropriate for use in remedial design because of their age (collected in 1997 through 2004), questionable location and water depth control, availability of nearby PDI data in most cases, and lack of influence on the surface SMA (i.e., concentrations below RALs). As such, for the purpose of SMA delineation, the current surface sediment dataset is a better representation of the current surface sediment conditions at T4 and is most appropriate for use in remedial design. The data density of surface sediment data within SMAs will be revisited during remedial design, and additional surface data may be collected in some areas.

6.3.2 Other Considerations for SMA Delineation

The PDI SMAs represent an initial refinement of the ROD SMAs based on updated surface sediment information from the 2019 PDI dataset, the 2018 Pre-RD Group dataset, and recent (2015 and 2017) post-maintenance dredging dataset. Vertical SMA delineation will be evaluated in the BODR. As detailed in USEPA's *Remedial Design Guidelines and Considerations* (USEPA 2020), SMAs will be

delineated by surface and subsurface contamination above RALs and where exposure to aquatic receptors is occurring or has the potential to occur. Further SMA refinement is anticipated to occur during the RD process based on site-specific conditions and additional, updated information. The following provides examples of factors that were or will be taken into consideration when updating the T4 SDU SMAs during RD:

- **Slip 3, Berth 411 Sheetpile Wall:** The sheetpile wall at Berth 411 provides a rigid barrier that physically separates a majority of the underpier area from the Slip 3 basin and prevents transport of sediments. This underpier area has unique physical and chemical characteristics that will require a separate remedial evaluation and technology application.
- **Slip 3, Former Pier 5 Pile Field:** All PDI samples proposed to be collected in this area were obstructed by pilings and other retaining structures. As a result, a subsequent phase of sampling will be needed to characterize this area and will be coordinated with additional riverbank sampling. If the supplemental sampling data indicate active remediation is warranted, the obstructed slope will require a separate remedial evaluation and technology application.
- **D/F Representativeness:** Additional consideration is warranted to evaluate the representativeness of D/F data when factoring background inputs, potential sources, and analytical results. Overall, 34% of PDI D/F data were qualified with a "J" by the laboratory to indicate an estimated, low-level detection below the RL. As discussed in Section 3.3.3, there was one EMPC-qualified result for PeCDD at location SG08 in Slip 3. The result was a detection above the EDL and below the RL at 0.000900 µg/kg, which is less than 1/10th of a part per trillion above the RAL of 0.00081 µg/kg. USEPA Region 10 validation guidance (USEPA 2014) allows EMPC qualified results below the RL to be treated as non-detects, but the most recent USEPA guidance (USEPA 2016a), which uses the more conservative approach of treating all EMPC qualified data as detected concentrations, was used for this PDI. This uncertainty, combined with the fact that the SG08 location represents the only surface sediment RAL exceedance for D/F in Slip 3, will need to be further evaluated during RD.

There is also significant uncertainty in the surface sediment D/F concentrations estimated in "J" qualified Pre-RD Group samples. As shown in Figures 6-1c and 6-e, PeCDD and TCDD RAL exceedances from Pre-RD Group stations in Slip 1 are typically "J" qualified (as estimated) and are largely inconsistent with D/F results from adjacent PDI stations, in some cases by an order of magnitude. Several Pre-RD Group stations with RAL exceedances for PeCDD are surrounded by PDI stations with PeCDD concentrations that are below the RAL and/or non-detect. As such, SMA delineation using D/F data from Pre-RD samples is also uncertain and will require refinement during RD.

In addition, the former Berth 405 underpier area may need further D/F characterization. Existing underpier sampling data from former Berth 405 were below RALs for PAHs, PCBs, and DDx. However, D/F were not analyzed in the underpier area.

- **T4 Riverbanks:** Additional riverbank sampling at T4 is being planned in consideration of riverbank data collected to date and observed sediment quality impacts in the adjacent submerged areas. The Port is working with USEPA on the implementation of a work plan that addresses specific riverbank areas and COCs with the potential to recontaminate T4 sediments. If additional riverbank controls are determined to be required, these will be coordinated with proposed in-water remedial actions.
- **Evaluation Subsurface RAL Exceedances:** Future design evaluations will consider subsurface data in terms of depth and elevation of contamination, concentration profiles and time trends, evidence for any ongoing natural recovery, and the potential for buried contamination to impact surface sediments or porewater in the zone of biological exposure. These design evaluations will be documented in the BODR and may be refined through RD. As further described in the ROD, an SMA will be delineated by surface and subsurface contamination above RALs and where exposure is occurring or has the potential to occur.

7 References

- AECOM and Geosyntec, 2019. *PDI Evaluation Report*. Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site. Prepared on behalf of Portland Harbor Pre-RD AOC Group. June 17, 2019.
- Anchor Environmental (Anchor Environmental, L.L.C.), 2007. *Final Design Analysis Report*. Terminal 4 Phase I Removal Action. Prepared for Port of Portland. June 30, 2008
- Anchor QEA, 2009. *Final Removal Action Completion Report*. Terminal 4 Phase I Removal Action. Prepared for the Port of Portland. June 2009.
- Anchor QEA, 2019a. *Pre-Remedial Design Investigation Work Plan*. Terminal 4 Remedy. Prepared for the U.S. Environmental Protection Agency (USEPA). March 8, 2019.
- Anchor QEA, 2019b. *Pre-Remedial Design Investigation Work Plan Addendum No. 1*. Terminal 4 Remedy. Prepared for USEPA. March 14, 2019.
- Hart Crowser, 2018. *Analytical Results on Post-Dredge Samples*. Terminal 4 Berth 410. Prepared for the Port of Portland. January 3, 2018.
- USEPA (U.S. Environmental Protection Agency), 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. Office of Solid Waste and Emergency Response. EPA 530/SW-846. 3rd Edition, September 1986; Update I, July 1992; Update II, September 1994; Update III, December 1996; Update IV, February 2007; Update V, July 2014.
- USEPA, 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. EPA540-R-08-005. January 2009.
- USEPA 2014. *Region 10 Data Validation and Review Guidelines for Polychlorinated Dibenzo-p-Dioxin and Polychlorinated Dibenzofuran Data (PCDD/PCDF)*. EPA-910-R-14-003. May 2014.
- USEPA, 2016a. National Functional Guidelines for High Resolution Superfund Methods Data Review. EPA-542-B-16-001. April 2016.
- USEPA. 2016b. *Draft Final Portland Harbor Feasibility Study*. June 2016.
- USEPA, 2017a. *Record of Decision: Portland Harbor Superfund Site*. January 2017.
- USEPA, 2017b. *National Functional Guidelines for Inorganic Superfund Methods Data Review*. Office of Superfund Remediation and Technology Innovation. EPA-540-R-2017-001. January 2017.
- USEPA, 2017c. *National Functional Guidelines for Organic Superfund Methods Data Review*. Office of Superfund Remediation and Technology Innovation. EPA 540 R 2017-002. January 2017.

USEPA, 2018. *Remedial Design Statement of Work, Portland Harbor Superfund Site. Terminal 4 Action Area.* June 2018.

USEPA, 2019. *Explanation of Significant Differences, Portland Harbor Superfund Site.* December 9, 2019.

USEPA, 2020. Remedial Design Guidelines and Considerations, Portland Harbor Superfund Site. February 28, 2020.

Tables

Table 2-1**Sampling Summary: Surface Sediment**

Station ID	Subarea	Collection Date	Actual Coordinates (NAD83ORNH) ¹		Mudline Elevation (feet NAVD88)	Sample ID	Sample Interval (cm)
			Easting (X)	Northing (Y)			
Underpier Surface Sediment Grabs							
T4-PDI2019-SG21	Slip 3	5/31/2019	7619690.91	713565.45	-16.1	T4-PDI2019-SG21-190531	0-27.8
T4-PDI2019-SG22	Slip 3	5/29/2019	7619839.92	713530.95	-14.6	T4-PDI2019-SG22-190529	0-26.5
T4-PDI2019-SG23	Slip 3	5/29/2019	7619981.76	713515.87	-8.9	T4-PDI2019-SG23-190529	0-26.3
T4-PDI2019-SG24	Slip 3	5/29/2019	7620149.58	713495.74	-8.1	T4-PDI2019-SG24-190529	0-25
T4-PDI2019-SG25	Slip 3	5/29/2019	7620286.46	713467.21	-12.6	T4-PDI2019-SG25-190529	0-27.3
T4-PDI2019-SG26	Slip 3	5/30/2019	7620423.41	713451.59	-10.2	T4-PDI2019-SG26-190530	0-26.2
T4-PDI2019-SG38	Slip 1	5/31/2019	7619717.89	714360.73	-6.2	T4-PDI2019-SG38-190531	0-26.3
T4-PDI2019-SG40	Slip 1	5/28/2019	7620030.20	714331.42	-2.7	T4-PDI2019-SG40-190528	0-29
T4-PDI2019-SG41	Slip 1	5/28/2019	7620172.8	714333.02	-7.6	FD-201905281308	0-27.3
						T4-PDI2019-SG41-190528	
Open-Water Surface Sediment Grabs							
T4-PDI2019-SG01	Berth 414	4/29/2019	7619699.50	712705.55	-16.4	T4-PDI2019-SG01-190429	0-26.2
T4-PDI2019-SG02	Berth 414	4/29/2019	7619625.71	712830.54	-20.3	T4-PDI2019-SG02-190429	0-25.7
T4-PDI2019-SG04	Slip 3	4/29/2019	7619832.79	713135.83	-31.5	T4-PDI2019-SG04-190429	0-26
T4-PDI2019-SG05	Slip 3	4/17/2019	7619990.23	713140.26	-36.9	T4-PDI2019-SG05-190417	0-25.3
T4-PDI2019-SG06	Slip 3	4/17/2019	7620144.61	713139.15	-33.0	T4-PDI2019-SG06-190417	0-24
T4-PDI2019-SG08	Slip 3	4/15/2019	7620378.39	713098.54	-28.2	T4-PDI2019-SG08-190415	0-27.7
T4-PDI2019-SG09	Slip 3	4/30/2019	7619649.11	713261.03	-34.9	T4-PDI2019-SG09-190430	0-29.5
T4-PDI2019-SG10	Slip 3	4/30/2019	7619837.31	713221.62	-31.8	T4-PDI2019-SG10-190430	0-28.2
T4-PDI2019-SG11	Slip 3	4/15/2019	7620135.15	713195.66	-31.1	T4-PDI2019-SG11-190415	0-28.3
T4-PDI2019-SG13	Slip 3	4/15/2019	7620426.74	713192.86	-25.4	T4-PDI2019-SG13-190415	0-29.5
T4-PDI2019-SG14	Slip 3	4/30/2019	7619693.85	713366.42	-45.6	T4-PDI2019-SG14-190430	0-22.8
T4-PDI2019-SG15	Slip 3	4/16/2019	7619861.58	713408.87	-45.7	T4-PDI2019-SG15-190416	0-21.7
T4-PDI2019-SG16	Slip 3	4/16/2019	7619999.16	713335.16	-38.2	T4-PDI2019-SG16-190416	0-28.3
T4-PDI2019-SG17	Slip 3	4/16/2019	7620137.72	713356.86	-43.5	T4-PDI2019-SG17-190416	0-25.2
T4-PDI2019-SG18	Slip 3	4/15/2019	7620287.03	713343.12	-41.7	FD-201904151441	0-26
						T4-PDI2019-SG18-190415	
T4-PDI2019-SG20	Slip 3	4/30/2019	7619637.68	713475.07	-37.5	T4-PDI2019-SG20-190430	0-26.3
T4-PDI2019-SG27	Wheeler Bay	4/29/2019	7619581.29	713681.64	-3.1	T4-PDI2019-SG27-190429	0-25.5
T4-PDI2019-SG28	Wheeler Bay	4/29/2019	7619659.88	713670.43	-3.6	T4-PDI2019-SG28-190429	0-24.7
T4-PDI2019-SG29	Wheeler Bay	4/29/2019	7619590.30	713754.27	-2.8	T4-PDI2019-SG29-190429	0-26.3
T4-PDI2019-SG30	Wheeler Bay	4/29/2019	7619666.19	713757.21	-1.3	T4-PDI2019-SG30-190429	0-26.7
T4-PDI2019-SG31	Wheeler Bay	5/1/2019	7619697.12	713830.8	7.7	T4-PDI2019-SG31-190501	0-24.3
T4-PDI2019-SG32	Wheeler Bay	5/2/2019	7619162.44	713876.18	-17.9	T4-PDI2019-SG32-190502	0-27.2
T4-PDI2019-SG33	Wheeler Bay	5/1/2019	7619332.54	713952.58	2.8	T4-PDI2019-SG33-190501	0-28.3
T4-PDI2019-SG34	Wheeler Bay	5/2/2019	7619040.61	714214.49	-11.5	T4-PDI2019-SG34-190502	0-25
T4-PDI2019-SG35	Slip 1	5/3/2019	7619111.61	714411.12	-22.2	T4-PDI2019-SG35-190503	0-27.5
T4-PDI2019-SG36	Slip 1	5/1/2019	7619279.70	714386.71	-11.5	T4-PDI2019-SG36-190501	0-23
T4-PDI2019-SG37	Slip 1	4/30/2019	7619586.08	714348.14	4.3	T4-PDI2019-SG37-190430	0-21.2
T4-PDI2019-SG42	Slip 1	5/1/2019	7619356.99	714373.82	-6.7	T4-PDI2019-SG42-190501	0-25.2
T4-PDI2019-SG43	Slip 1	5/1/2019	7619430.16	714371.13	-6.8	T4-PDI2019-SG43-190501	0-25.8
T4-PDI2019-SG44	Slip 1	5/1/2019	7619502.91	714368.55	-8.7	FD-201905011017	0-26
						T4-PDI2019-SG44-190501	
T4-PDI2019-SG45	Slip 1	5/3/2019	7619358.15	714431.77	-24.7	T4-PDI2019-SG45-190503	0-26.8
T4-PDI2019-SG46	Slip 1	5/3/2019	7619440.11	714420.44	-23.8	T4-PDI2019-SG46-190503	0-25.8
T4-PDI2019-SG47	Slip 1	5/3/2019	7619504.69	714426.61	-23.9	T4-PDI2019-SG47-190503	0-28
T4-PDI2019-SG48	Slip 1	5/3/2019	7619134.01	714506.6	-28.6	T4-PDI2019-SG48-190503	0-27.8
T4-PDI2019-SG49	Slip 1	5/3/2019	7619434.26	714484.28	-28.2	T4-PDI2019-SG49-190503	0-26.3
T4-PDI2019-SG50	Slip 1	4/18/2019	7619574.46	714481.13	-26.6	T4-PDI2019-SG50-190418	0-25.8
T4-PDI2019-SG51	Slip 1	4/17/2019	7619697.03	714486.49	-25.7	T4-PDI2019-SG51-190417	0-29.5
T4-PDI2019-SG52	Slip 1	4/17/2019	7620025.47	714474.54	-26.8	T4-PDI2019-SG52-190417	0-29.5
T4-PDI2019-SG53	Slip 1	4/16/2019	7620315.97	714434.45	-28.4	T4-PDI2019-SG53-190416	0-29.5
T4-PDI2019-SG54	Slip 1	4/16/2019	7620399.28	714449.04	-25.2	T4-PDI2019-SG54-190416	0-24.8
T4-PDI2019-SG55	Slip 1	5/3/2019	7619285.37	714600.54	-27.8	T4-PDI2019-SG55-190503	0-27.8
T4-PDI2019-SG56	Slip 1	4/18/2019	7619538.37	714587.53	-26.8	T4-PDI2019-SG56-190418	0-24.8
T4-PDI2019-SG57	Slip 1	4/17/2019	7619721.34	714619.01	-27.5	T4-PDI2019-SG57-190417	0-29.5
T4-PDI2019-SG58	Slip 1	4/17/2019	7619883.05	714619.00	-27.9	T4-PDI2019-SG58-190417	0-28.5
T4-PDI2019-SG59	Slip 1	4/17/2019	7620029.89	714612.27	-28.8	T4-PDI2019-SG59-190417	0-29.5
T4-PDI2019-SG60	Slip 1	4/17/2019	7620176.98	714610.24	-27.0	FD-201904171301	0-27.8
						T4-PDI2019-SG60-190417	
T4-PDI2019-SG61	Slip 1	4/16/2019	7620323.58	714570.52	-22.8	T4-PDI2019-SG61-190416	0-24.8
T4-PDI2019-SG62	Slip 1	4/18/2019	7619286.46	714659.32	-23.2	T4-PDI2019-SG62-190418	0-25.7
T4-PDI2019-SG63	Slip 1	4/18/2019	7619436.26	714651.74	-22.9	T4-PDI2019-SG63-190418	0-24.7
T4-PDI2019-SG64	Slip 1	4/18/2019	76195				

Table 2-2
Sampling Summary: Subsurface Sediment

Station ID	Subarea	Collection Date	Actual Coordinates (NAD83ORNH)		Mudline Elevation (feet NAVD88)	Accepted Attempt	Total Attempts	Penetration Depth (feet)	Recovery Length (feet)	Recovery Percent
			Easting (X)	Northing (Y)						
Underpier Subsurface Sediment Cores										
T4-PDI2019-SC21	Slip 3	5/31/2019	7619690.81	713564.79	2.5	1	1	3.3	2.7	82%
T4-PDI2019-SC22	Slip 3	5/30/2019	7619834.07	713525.77	-25.7	1	1	2.9	2.5	86%
T4-PDI2019-SC23	Slip 3				Station Abandoned					
T4-PDI2019-SC24	Slip 3	5/29/2019	7620144.65	713476.60	-23.6	1	1	2.9	2.2	75%
T4-PDI2019-SC25	Slip 3	5/29/2019	7620285.20	713452.23	-24.4	1	1	2.8	2.2	78%
T4-PDI2019-SC26	Slip 3	5/30/2019	7620422.81	713447.63	-18.1	1	1	3.2	2.3	71%
T4-PDI2019-SC38	Slip 1	5/31/2019	7619716.14	714358.79	-3.2	1	1	3.1	2.4	77%
T4-PDI2019-SC39	Slip 1				Station Abandoned					
T4-PDI2019-SC40	Slip 1				Station Abandoned					
T4-PDI2019-SC41	Slip 1	5/28/2019	7620173.11	714340.68	-4.0	2	2	1.8	1.2	67%
Open-Water Subsurface Sediment Cores										
T4-PDI2019-SC03	Berth 414	5/20/2019	7619679.82	712880.62	-15.5	4	4	14.4	9.8	68%
T4-PDI2019-SC12	Slip 3	5/21/2019	7620267.29	713163.17	-30.4	1	3	15	9.2	61%
T4-PDI2019-SC13	Slip 3	5/21/2019	7620432.01	713193.19	-26.5	2	3	15	11.6	77%
T4-PDI2019-SC18	Slip 3	5/21/2019	7620288.92	713340.06	-38.2	1	1	15	14.0	93%
T4-PDI2019-SC19	Slip 3	5/21/2019	7620409.43	713316.02	-41.8	1	1	15	12.5	83%
T4-PDI2019-SC27	Wheeler Bay	5/24/2019	7619586.64	713678.42	-9.9	2	2	15	13.3	89%
T4-PDI2019-SC28	Wheeler Bay	5/23/2019	7619662.26	713665.93	-7.6	2	3	15	10.5	70%
T4-PDI2019-SC29	Wheeler Bay	5/24/2019	7619589.49	713749.47	-7.0	3	3	14.5	11.7	81%
T4-PDI2019-SC30	Wheeler Bay	5/24/2019	7619663.05	713770.48	-3.8	3	3	15	11.5	77%
T4-PDI2019-SC32	Wheeler Bay	5/22/2019	7619166.58	713870.20	-2.2	2	2	15	12.2	81%
T4-PDI2019-SC42	Slip 1	5/23/2019	7619314.02	714377.33	-9.3	3	3	9.3	4.7	51%
T4-PDI2019-SC43	Slip 1	5/23/2019	7619435.82	714368.42	-16.9	1	3	9.7	6.3	65%
T4-PDI2019-SC44	Slip 1	5/23/2019	7619507.85	714365.15	-16.9	2	2	13.5	13.4	99%
T4-PDI2019-SC45	Slip 1	5/22/2019	7619366.27	714428.74	-11.0	3	3	13.4	12.7	95%
T4-PDI2019-SC46	Slip 1	5/22/2019	7619440.66	714419.35	-17.0	2	3	15	7.4	49%
T4-PDI2019-SC47	Slip 1	5/22/2019	7619509.99	714426.52	-4.3	2	3	15	8.0	53%
T4-PDI2019-SC67	Berth 401	5/21/2019	7618648.55	715261.17	-14.4	2	3	14.9	8.6	58%

Note:

NAVD88: North American Vertical Datum of 1988

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Berth 414	Berth 414	Slip 3	Slip 3					
	T4-PDI2019-SG01	T4-PDI2019-SG02	T4-PDI2019-SG04	T4-PDI2019-SG05	T4-PDI2019-SG06	T4-PDI2019-SG08	T4-PDI2019-SG09	T4-PDI2019-SG10	
	SG01	SG02	SG04	SG05	SG06	SG08	SG09	SG10	
	T4-PDI2019-SG01- 190429	T4-PDI2019-SG02- 190429	T4-PDI2019-SG04- 190429	T4-PDI2019-SG05- 190417	T4-PDI2019-SG06- 190417	T4-PDI2019-SG08- 190415	T4-PDI2019-SG09- 190430	T4-PDI2019-SG10- 190430	
	0 - 26.2 cm	0 - 25.7 cm	0 - 26 cm	0 - 25.3 cm	0 - 24 cm	0 - 27.7 cm	0 - 29.5 cm	0 - 28.2cm	
	4/29/2019	4/29/2019	4/29/2019	4/17/2019	4/17/2019	4/15/2019	4/30/2019	4/30/2019	
Conventional Parameters (ppt)									
Total organic carbon		2.5	2.3	0.074	0.063 J	0.086 J	1.7 J	1.6	1.9
Total solids		42.3	43.1	73.9	74.7	75.5	45.9	53.8	48.8
Grain Size (ppt)									
Gravel (>2mm)		0.05	0.010 U	1.39	4.94	7.98	0.68	0.03	0.08
Sand (2.0mm - 0.063mm)		22.4	29.6	95.4	92.3	89.2	53.1	55.4	44.7
Silt, 5-63 micron		56.3	54	2.7	1.9	2	31.4	32.2	40
Clay, <5 micron		21.3	16.4	0.5	0.9	0.8	14.8	12.4	15.2
Percent retained 63 micron sieve (#230)		4.29	4.26	0.11	0.1	0.16	1.63	1.27	1.61
Percent retained 75 micron sieve (#200)		7	7.8	0.22	0.19	0.29	3.43	2.34	3.13
Percent retained 106 micron sieve (#140)		4.9	6.02	0.34	0.29	0.4	3.05	1.93	2.75
Percent retained 150 micron sieve (#100)		3.89	5.84	4.03	3.33	4.1	11.1	7.39	8.99
Percent retained 250 micron sieve (#60)		1.8	4.38	38.9	33.9	35.3	27.2	28.3	22.1
Percent retained 425 micron sieve (#40)		0.49	1.29	44.9	46.9	41.6	6.51	13.7	5.91
Percent retained 850 micron sieve (#20)		0.04	0.02	6.92	7.65	7.42	0.18	0.44	0.27
Percent retained 2000 micron sieve (#10)		0.05	0.010 U	1.05	2.56	2.96	0.29	0.01	0.05
Percent retained 4750 micron sieve (#4)		0.010 U	0.010 U	0.35	2.38	5.02	0.4	0.01	0.03
Polycyclic Aromatic Hydrocarbons (µg/kg)									
2-Methylnaphthalene		49.8 U	488 U	288 U	272 U	276 U	463 U	395 U	435 U
Acenaphthene		17.0 J	244 U	144 U	96.4 J	138 U	232 U	198 U	218 U
Acenaphthylene		24.9 U	244 U	144 U	136 U	138 U	232 U	198 U	208 J
Anthracene		23.4 J	244 U	144 U	165	217	246	198 U	446
Benzo(a)anthracene		130	372 J	266 J	498	721	870	323 J	1360
Benzo(a)pyrene		169	565	381	661	941	1220	405	2070
Benzo(b)fluoranthene		224 J	718 J	453 J	607 J	894 J	1280 J	501 J	2230 J
Benzo(g,h,i)perylene		127	379	285	459	646	885	223	1440
Benzo(k)fluoranthene		79.3 J	282 J	150 J	232 J	306 J	412 J	171 J	883 J
Chrysene		159	489 J	291 J	592	821	1040	313 J	1580
Dibenzo(a,h)anthracene		28.3	244 U	144 U	136 U	75.8 J	135 J	198 U	181 J
Fluoranthene		234 J	686	514	1260 J	1660	1910	563	3210
Fluorene		16.5 J	244 U	144 U	70.4 J	101 J	232 U	198 U	212 J
Indeno(1,2,3-c,d)pyrene		107	364	298	433	607	866	257	1330
Naphthalene	140000	49.8 U	488 U	288 U	272 U	150 J	232 J	395 U	400 J
Phenanthrene		125	377	142 J	603	594	900	300	1640
Pyrene		213 J	666	702	1620 J	2100	2400	662	4020
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		303 JT	1000 JT	600 JT	839 JT	1200 JT	1690 JT	672 JT	3110 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	240 JT	836 JT	560 JT	886 JT	1240 JT	1700 JT	614 JT	2750 JT
PH-ROD Total PAH (U=1/2 max limit)	30000	1700 JT	6000 JT	4100 JT	7700 JT	10000 JT	13000 JT	4600 JT	22000 JT
Dioxin Furans (µg/kg)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	--	--	0.000123 U	--	--	0.000233 U	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	--	--	0.000408 J	--	--	0.000900 J	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	--	0.00101 J	--	--	0.00185 J	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	--	0.00626	--	--	0.00742	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	--	0.00184 J	--	--	0.00363 J	--

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Berth 414	Berth 414	Slip 3	Slip 3						
	T4-PDI2019-SG01	T4-PDI2019-SG02	T4-PDI2019-SG04	T4-PDI2019-SG05	T4-PDI2019-SG06	T4-PDI2019-SG08	T4-PDI2019-SG09	T4-PDI2019-SG10		
	SG01	SG02	SG04	SG05	SG06	SG08	SG09	SG10		
	T4-PDI2019-SG01- 190429	T4-PDI2019-SG02- 190429	T4-PDI2019-SG04- 190429	T4-PDI2019-SG05- 190417	T4-PDI2019-SG06- 190417	T4-PDI2019-SG08- 190415	T4-PDI2019-SG09- 190430	T4-PDI2019-SG10- 190430		
	0 - 26.2 cm	0 - 25.7 cm	0 - 26 cm	0 - 25.3 cm	0 - 24 cm	0 - 27.7 cm	0 - 29.5 cm	0 - 28.2cm		
	4/29/2019	4/29/2019	4/29/2019	4/17/2019	4/17/2019	4/15/2019	4/30/2019	4/30/2019		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)			--	--	0.164	--	0.226	--	--	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)			--	--	1.58	--	2.69	--	--	
Total Tetrachlorodibenzo-p-dioxin (TCDD)			--	--	0.000123 U	--	0.00345	--	--	
Total Pentachlorodibenzo-p-dioxin (PeCDD)			--	--	0.000873 J	--	0.00707 J	--	--	
Total Hexachlorodibenzo-p-dioxin (HxCDD)			--	--	0.0322 J	--	0.0675	--	--	
Total Heptachlorodibenzo-p-dioxin (HpCDD)			--	--	0.367	--	0.639	--	--	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	--	--	--	0.000173 U	--	0.00115	--	--	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)			--	--	0.000430 J	--	0.00129 J	--	--	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	--	--	0.000782 J	--	0.00150 J	--	--	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.04	--	--	--	0.00425 J	--	0.00865	--	--	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			--	--	0.000963 J	--	0.00276 J	--	--	
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			--	--	0.000588 J	--	0.00113 J	--	--	
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			--	--	0.00143 J	--	0.00264 J	--	--	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			--	--	0.0141	--	0.033	--	--	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			--	--	0.00140 J	--	0.00320 J	--	--	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			--	--	0.02	--	0.111	--	--	
Total Tetrachlorodibenzofuran (TCDF)			--	--	0.000173 U	--	0.0102 J	--	--	
Total Pentachlorodibenzofuran (PeCDF)			--	--	0.00946 J	--	0.0214	--	--	
Total Hexachlorodibenzofuran (HxCDF)			--	--	0.0278	--	0.066	--	--	
Total Heptachlorodibenzofuran (HpCDF)			--	--	0.0446	--	0.108	--	--	
PCB Congeners (µg/kg)										
<i>Individual congener results available but not shown</i>										
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	0.492 JT	0.442 JT	0.597 JT	0.665 JT	1.02 JT	4.05 JT	2.12 JT	0.723 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 3	Slip 3							
	T4-PDI2019-SG11	T4-PDI2019-SG13	T4-PDI2019-SG14	T4-PDI2019-SG15	T4-PDI2019-SG16	T4-PDI2019-SG17	T4-PDI2019-SG18	T4-PDI2019-SG20	
	SG11	SG13	SG14	SG15	SG16	SG17	SG18	SG20	
	T4-PDI2019-SG11- 190415	T4-PDI2019-SG13- 190415	T4-PDI2019-SG14- 190430	T4-PDI2019-SG15- 190416	T4-PDI2019-SG16- 190416	T4-PDI2019-SG17- 190416	T4-PDI2019-SG18- 190415	T4-PDI2019-SG20- 190430	
	0 - 28.3 cm	0 - 29.5 cm	0 - 22.8 cm	0 - 21.7 cm	0 - 28.3 cm	0 - 25.2 cm	0 - 26 cm	0 - 26.3 cm	
	4/15/2019	4/15/2019	4/30/2019	4/16/2019	4/16/2019	4/16/2019	4/15/2019	4/30/2019	
	RAL	PTW							
Conventional Parameters (ppt)									
Total organic carbon			1.1 J	1.4 J	0.14	0.064 J	1.1 J	0.11 J	0.53 JT
Total solids			52.1	49.2	74.9	75.8	50.6	71.4	63.2 T
Grain Size (ppt)									
Gravel (>2mm)			0.33	0.2	0.98	2.97	0.27	0.4	0.33 T
Sand (2.0mm - 0.063mm)			66	58.8	94.5	93.8	66.5	94.7	81.6 T
Silt, 5-63 micron			28.8	29.7	3.5	2.8	22.2	4.1	9.85 T
Clay, <5 micron			4.9	11.3	0.9	0.4	11	0.8	8.20 T
Percent retained 63 micron sieve (#230)			1.31	1.61	0.21	0.23	0.93	0.18	0.49 T
Percent retained 75 micron sieve (#200)			2.65	2.99	0.36	0.39	1.66	0.36	0.980 T
Percent retained 106 micron sieve (#140)			3.4	3.49	0.74	0.65	2.16	0.84	1.30 T
Percent retained 150 micron sieve (#100)			15.2	14	11.1	6.93	13.9	11.6	9.73 T
Percent retained 250 micron sieve (#60)			33.2	28.8	50	40.9	35.3	50.9	42.9 T
Percent retained 425 micron sieve (#40)			9.71	7.57	30.1	40.7	12.2	29.6	25.4 T
Percent retained 850 micron sieve (#20)			0.56	0.31	2.03	4.06	0.24	1.27	0.92 T
Percent retained 2000 micron sieve (#10)			0.28	0.2	0.37	1.18	0.12	0.32	0.12 T
Percent retained 4750 micron sieve (#4)			0.05	0.010 U	0.62	1.78	0.15	0.08	0.41 T
Polycyclic Aromatic Hydrocarbons (µg/kg)									
2-Methylnaphthalene			329 J	430 U	27.7 U	27.4 U	418 U	29.4 U	17.1 JT
Acenaphthene			252	216 U	13.9 U	13.7 U	209 U	33.2	19.7 T
Acenaphthylene			788	216 U	13.9 U	13.7 U	209 U	9.60 J	19.9 T
Anthracene			6370	246	13.9 U	13.7 U	182 J	45.7	78.0 JT
Benzo(a)anthracene			8980	772	20.1 J	26.4 J	827	220	291 JT
Benzo(a)pyrene			12300	1070	29.2	31.9	1110	298	367 T
Benzo(b)fluoranthene			10900 J	1140 J	31.1 J	37.5 J	1170 J	327 J	425 JT
Benzo(g,h,i)perylene			7850	803	17.3	26.1	883	210	293 T
Benzo(k)fluoranthene			3910 J	494 J	15.7 J	15.5 J	471 J	104 J	166 JT
Chrysene			10300	911	19.4 J	31.9 J	945	225	343 JT
Dibenzo(a,h)anthracene			1030	123 J	13.9 U	13.7 U	125 J	38.6	35.6 T
Fluoranthene			25500	1560	32.1	51.7	2060	368	603 T
Fluorene			2090	107 J	13.9 U	13.7 U	209 U	20.1	33.8 T
Indeno(1,2,3-c,d)pyrene			6900	780	16.3	27	859	197	295 T
Naphthalene	140000		1850	430 U	27.7 U	27.4 U	251 J	29.1 J	55.0 T
Phenanthrene			19200	846	16	22.9	738	166	307 T
Pyrene			31000	1810	35.6	60.6	2520	401	684 T
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)			14800 JT	1630 JT	46.8 JT	53.0 JT	1640 JT	431 JT	591 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000		16000 JT	1500 JT	43.1 JT	48.0 JT	1530 JT	410 JT	505 JT
PH-ROD Total PAH (U=1/2 max limit)	30000		150000 JT	11000 JT	295 JT	393 JT	12700 JT	2700 JT	4030 JT
Dioxin Furans (µg/kg)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	--	0.000309 U	0.0000944 U	--	--	--	0.000193 UT
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	--	0.000320 U	0.000206 U	--	--	--	0.000305 JT
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			--	0.000813 J	0.000256 U	--	--	--	0.000609 JT
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			--	0.00288 J	0.000365 J	--	--	--	0.00242 JT
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			--	0.00136 J	0.000257 U	--	--	--	0.00122 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 3	Slip 3								
	T4-PDI2019-SG11	T4-PDI2019-SG13	T4-PDI2019-SG14	T4-PDI2019-SG15	T4-PDI2019-SG16	T4-PDI2019-SG17	T4-PDI2019-SG18	T4-PDI2019-SG20		
	SG11	SG13	SG14	SG15	SG16	SG17	SG18	SG20		
	T4-PDI2019-SG11- 190415	T4-PDI2019-SG13- 190415	T4-PDI2019-SG14- 190430	T4-PDI2019-SG15- 190416	T4-PDI2019-SG16- 190416	T4-PDI2019-SG17- 190416	T4-PDI2019-SG18- 190415	T4-PDI2019-SG20- 190430		
	0 - 28.3 cm	0 - 29.5 cm	0 - 22.8 cm	0 - 21.7 cm	0 - 28.3 cm	0 - 25.2 cm	0 - 26 cm	0 - 26.3 cm		
	4/15/2019	4/15/2019	4/30/2019	4/16/2019	4/16/2019	4/16/2019	4/15/2019	4/30/2019		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		--	0.0751	0.00812	--	--	0.0573 T	--		
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		--	0.709	0.0794	--	--	0.564 T	--		
Total Tetrachlorodibenzo-p-dioxin (TCDD)		--	0.000611 J	0.0000944 U	--	--	0.000826 JT	--		
Total Pentachlorodibenzo-p-dioxin (PeCDD)		--	0.000558 J	0.000206 U	--	--	0.00146 JT	--		
Total Hexachlorodibenzo-p-dioxin (HxCDD)		--	0.0216	0.00216	--	--	0.0179 JT	--		
Total Heptachlorodibenzo-p-dioxin (HpCDD)		--	0.205	0.0172	--	--	0.14 T	--		
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	--	0.000498 J	0.000109 U	--	--	0.000427 JT	--		
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		--	0.000502 J	0.000234 U	--	--	0.000502 JT	--		
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	--	0.000471 J	0.000209 U	--	--	0.000514 JT	--	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.04	--	0.00236 J	0.000146 J	--	--	0.00178 JT	--		
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		--	0.000838 J	0.000107 U	--	--	0.000622 JT	--		
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		--	0.000446 J	0.000160 U	--	--	0.000163 UT	--		
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		--	0.000921 J	0.000108 U	--	--	0.000670 JT	--		
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		--	0.0101	0.00139 J	--	--	0.0132 T	--		
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		--	0.000732 J	0.000141 U	--	--	0.00104 JT	--		
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		--	0.0231	0.00371 J	--	--	0.0407 T	--		
Total Tetrachlorodibenzofuran (TCDF)		--	0.000967	0.000109 U	--	--	0.00160 JT	--		
Total Pentachlorodibenzofuran (PeCDF)		--	0.00649 J	0.000372	--	--	0.00499 JT	--		
Total Hexachlorodibenzofuran (HxCDF)		--	0.0182 J	0.00188 J	--	--	0.0171 T	--		
Total Heptachlorodibenzofuran (HpCDF)		--	0.0331	0.00401	--	--	0.0438 T	--		
PCB Congeners (µg/kg)										
<i>Individual congener results available but not shown</i>										
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	8.22 JT	11.5 JT	0.873 JT	0.878 JT	3.64 JT	1.07 JT	5.18 JT	1.81 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Wheeler Bay	Wheeler Bay							
	T4-PDI2019-SG27	T4-PDI2019-SG28	T4-PDI2019-SG29	T4-PDI2019-SG30	T4-PDI2019-SG31	T4-PDI2019-SG32	T4-PDI2019-SG33	T4-PDI2019-SG34	
	SG27	SG28	SG29	SG30	SG31	SG32	SG33	SG34	
	T4-PDI2019-SG27- 190429	T4-PDI2019-SG28- 190429	T4-PDI2019-SG29- 190429	T4-PDI2019-SG30- 190429	T4-PDI2019-SG31- 190501	T4-PDI2019-SG32- 190502	T4-PDI2019-SG33- 190501	T4-PDI2019-SG34- 190502	
	0 - 25.5 cm	0 - 24.7 cm	0 - 26.3 cm	0 - 26.7 cm	0 - 24.3 cm	0 - 27.2 cm	0 - 28.3 cm	0 - 25 cm	
	4/29/2019	4/29/2019	4/29/2019	4/29/2019	5/1/2019	5/2/2019	5/1/2019	5/2/2019	
	RAL	PTW							
Conventional Parameters (pct)									
Total organic carbon		2.3	2.2	2.3	3.4	0.076	2.3	1	1.8
Total solids		42.1	45.2	41.2	43.2	79	41.4	60.3	45.4
Grain Size (pct)									
Gravel (>2mm)		0.010 U	0.02	0.010 U	1.43	2.95	0.010 U	1.13	0.010 U
Sand (2.0mm - 0.063mm)		16	22.7	10.6	32.2	94.1	19.6	62.2	31.8
Silt, 5-63 micron		65.4	59.3	68.3	49.3	1.1	60.5	27.2	52.8
Clay, <5 micron		18.6	17.9	21.1	17	1.8	19.8	9.4	15.5
Percent retained 63 micron sieve (#230)		3.02	4.07	2.7	5.21	0.12	4.1	3.32	6.26
Percent retained 75 micron sieve (#200)		4.43	6.33	3.42	8.39	0.23	9.78	6.21	12.1
Percent retained 106 micron sieve (#140)		3.22	4.33	1.88	6.22	0.37	4.03	6.08	6.25
Percent retained 150 micron sieve (#100)		3.28	4.87	1.67	6.04	4.54	0.87	18.3	5.14
Percent retained 250 micron sieve (#60)		1.52	2.64	0.79	3.45	33.7	0.75	22.3	1.59
Percent retained 425 micron sieve (#40)		0.5	0.45	0.12	2	48.7	0.11	5.25	0.38
Percent retained 850 micron sieve (#20)		0.01	0.03	0.01	0.96	6.4	0.010 U	0.75	0.01
Percent retained 2000 micron sieve (#10)		0.010 U	0.02	0.010 U	1.29	1.68	0.010 U	0.81	0.010 U
Percent retained 4750 micron sieve (#4)		0.010 U	0.010 U	0.010 U	0.14	1.27	0.010 U	0.32	0.010 U
Polycyclic Aromatic Hydrocarbons (µg/kg)									
2-Methylnaphthalene		49.8 UJ	469 U	50.1 U	489 U	26.9 U	51.2 U	350 U	45.7 U
Acenaphthene		15.5 J	235 U	25.1 U	245 U	13.5 U	25.6 U	175 U	22.9 U
Acenaphthylene		25.0 UJ	235 U	25.1 U	245 U	13.5 U	25.6 U	175 U	22.9 U
Anthracene		28.7 J	135 J	16.0 J	245 U	13.5 U	25.6 U	175 U	22.9 U
Benzo(a)anthracene		135 J	842	70	605 J	8.93 J	55.8	191 J	48.1
Benzo(a)pyrene		201 J	1120	98.7	859	24.7	82.1	264	65.8
Benzo(b)fluoranthene		229 J	1440 J	110 J	962 J	33.4 J	84.2 J	300 J	82.0 J
Benzo(g,h,i)perylene		126 J	816	66.1	608	18.3	56.1	136 J	45.3
Benzo(k)fluoranthene		94.8 J	549 J	44.9 J	447 J	15.0 J	26.1 J	168 J	29.2 J
Chrysene		165 J	893	80	650 J	18.5 J	59.6	205 J	63.3
Dibenzo(a,h)anthracene		24.1 J	165 J	13.2 J	245 U	13.5 U	25.6 U	175 U	22.9 U
Fluoranthene		240 J	1180	126	841	12.1 J	80.8	605	111
Fluorene		14.7 J	235 U	25.1 U	245 U	13.5 U	25.6 U	131 J	22.9 U
Indeno(1,2,3-c,d)pyrene		133 J	880	69.1	614	14.3	55.1	141 J	45.2
Naphthalene	140000	49.8 UJ	469 U	50.1 U	489 U	26.9 U	51.2 U	350 U	45.7 U
Phenanthrene		107 J	533	55.1	345	13.5 U	23.8 J	395	44.4
Pyrene		251 J	1180	141	902	12.8 J	110	510	119
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		324 JT	1990 JT	150 JT	1410 JT	48.4 JT	110 JT	470 JT	111 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	276 JT	1600 JT	140 JT	1200 JT	37.3 JT	115 JT	420 JT	95.1 JT
PH-ROD Total PAH (U=1/2 max limit)	30000	1800 JT	11000 JT	980 JT	7900 JT	225 JT	750 JT	3700 JT	756 JT
Dioxin Furans (µg/kg)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000153 U	0.000267 U	0.000233 U	0.000152 U	0.000193 U	--	0.000239 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000729 J	0.000405 J	0.000401 U	0.000185 U	0.000324 U	--	0.000138 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00120 J	0.00123 J	0.000867 J	0.000262 U	0.000487 U	--	0.000287 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00389 J	0.00567	0.00435 J	0.000552 J	0.00178 J	--	0.00221 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00181 J	0.00256 J	0.00185 J	0.000268 U	0.000816 J	--	0.000718 J

Table 4-1a
Surface Sediment Data: Open-Water Stations

Abbreviated Location ID	SubArea	Wheeler Bay								
	Location ID	T4-PDI2019-SG27	T4-PDI2019-SG28	T4-PDI2019-SG29	T4-PDI2019-SG30	T4-PDI2019-SG31	T4-PDI2019-SG32	T4-PDI2019-SG33	T4-PDI2019-SG34	
	Sample ID	SG27	SG28	SG29	SG30	SG31	SG32	SG33	SG34	
	Depth	T4-PDI2019-SG27- 190429	T4-PDI2019-SG28- 190429	T4-PDI2019-SG29- 190429	T4-PDI2019-SG30- 190429	T4-PDI2019-SG31- 190501	T4-PDI2019-SG32- 190502	T4-PDI2019-SG33- 190501	T4-PDI2019-SG34- 190502	
	Sample Date	0 - 25.5 cm 4/29/2019	0 - 24.7 cm 4/29/2019	0 - 26.3 cm 4/29/2019	0 - 26.7 cm 4/29/2019	0 - 24.3 cm 5/1/2019	0 - 27.2 cm 5/2/2019	0 - 28.3 cm 5/1/2019	0 - 25 cm 5/2/2019	
	RAL									
	PTW									
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		0.116	0.268	0.144	0.0168	0.0403	--	0.0604	--	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		0.783	2	1.06	0.157	0.285	--	0.669	--	
Total Tetrachlorodibenzo-p-dioxin (TCDD)		0.00176	0.00226	0.00199 J	0.000152 U	0.000193 U	--	0.000451 J	--	
Total Pentachlorodibenzo-p-dioxin (PeCDD)		0.00581 J	0.00656 J	0.00292 J	0.000185 U	0.000324 U	--	0.000776 J	--	
Total Hexachlorodibenzo-p-dioxin (HxCDD)		0.0468	0.0863 J	0.0454 J	0.00346 J	0.012	--	0.0134	--	
Total Heptachlorodibenzo-p-dioxin (HpCDD)		0.334	0.854	0.398	0.0651	0.0838	--	0.138	--	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		0.6	0.00221	0.00123	0.000879 J	0.000189 U	0.000270 U	--	0.000143 U	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)			0.00200 J	0.00111 J	0.000515 U	0.000192 U	0.000544 U	--	0.000216 U	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.000954 J	0.00172 J	0.000663 J	0.000183 U	0.000523 U	--	0.000406 J	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.00255 J	0.00394 J	0.00223 J	0.000138 U	0.000676 J	--	0.00140 J	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.000915 J	0.00116 J	0.00120 J	0.000139 U	0.000177 U	--	0.000540 J	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			0.000426 J	0.000851 J	0.000463 U	0.000199 U	0.000254 U	--	0.000158 U	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.000764 J	0.00144 J	0.00102 J	0.000153 U	0.000485 J	--	0.000703 J	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			0.0118	0.0232	0.0205	0.00178 J	0.00544	--	0.0111	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			0.00147 J	0.00247 J	0.00163 J	0.000187 U	0.000271 U	--	0.000767 J	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			0.0383	0.0824	0.0695	0.00623 J	0.0111	--	0.0336	--
Total Tetrachlorodibenzofuran (TCDF)			0.00582 J	0.00535 J	0.00418 J	0.000189 U	0.000270 U	--	0.000711 J	--
Total Pentachlorodibenzofuran (PeCDF)			0.0124 J	0.0135 J	0.00863 J	0.000343 J	0.00332	--	0.00541 J	--
Total Hexachlorodibenzofuran (HxCDF)			0.0231 J	0.0417 J	0.0303 J	0.00180 J	0.00899 J	--	0.0189 J	--
Total Heptachlorodibenzofuran (HpCDF)			0.0554	0.107	0.0787	0.00647	0.0164	--	0.0415	--
PCB Congeners (µg/kg)										
<i>Individual congener results available but not shown</i>										
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	1.81 JT	0.440 JT	9.21 JT	16.9 JT	5.93 JT	1.55 JT	23.4 JT	6.37 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1							
	T4-PDI2019-SG35	T4-PDI2019-SG36	T4-PDI2019-SG37	T4-PDI2019-SG42	T4-PDI2019-SG43	T4-PDI2019-SG44	T4-PDI2019-SG45	T4-PDI2019-SG46	
	SG35	SG36	SG37	SG42	SG43	SG44	SG45	SG46	
	T4-PDI2019-SG35- 190503	T4-PDI2019-SG36- 190501	T4-PDI2019-SG37- 190430	T4-PDI2019-SG42- 190501	T4-PDI2019-SG43- 190501	T4-PDI2019-SG44- 190501	T4-PDI2019-SG45- 190503	T4-PDI2019-SG46- 190503	
	0 - 27.5 cm	0 - 23 cm	0 - 21.2 cm	0 - 25.2 cm	0 - 25.8 cm	0 - 26 cm	0 - 26.8 cm	0 - 25.8 cm	
	5/3/2019	5/1/2019	4/30/2019	5/1/2019	5/1/2019	5/1/2019	5/3/2019	5/3/2019	
	RAL	PTW							
Conventional Parameters (pct)									
Total organic carbon			1.1	0.27	0.16	0.11	0.083	0.095 T	2.1
Total solids			58.5	73.3	74.7	75.8	97.1	75.2 T	41.7
Grain Size (pct)									
Gravel (>2mm)			0.76	2.15	3.68	1.09	2.14	2.17 T	0.010 U
Sand (2.0mm - 0.063mm)			63.7	89.1	92.6	94	92.5	92.9 T	18
Silt, 5-63 micron			25.4	6.5	2.9	3.1	3.6	2.95 T	71.2
Clay, <5 micron			10.2	2.3	0.8	1.8	2.1	1.95 T	10.8
Percent retained 63 micron sieve (#230)			1.31	0.49	0.37	0.24	0.35	0.29 T	1.86
Percent retained 75 micron sieve (#200)			2.18	1.4	1	0.9	1.03	0.89 T	2.23
Percent retained 106 micron sieve (#140)			1.96	2.68	2.15	2.76	1.71	2.12 T	1.54
Percent retained 150 micron sieve (#100)			10.5	16.3	16.1	19.9	12.8	15.7 T	2.97
Percent retained 250 micron sieve (#60)			32.9	46.7	49.1	51.3	52	49.2 T	6.23
Percent retained 425 micron sieve (#40)			13.5	19.6	22.3	17.6	23.3	22.9 T	3.06
Percent retained 850 micron sieve (#20)			1.31	1.98	1.55	1.33	1.26	1.93 T	0.11
Percent retained 2000 micron sieve (#10)			0.62	1.25	0.56	0.61	0.46	0.77 T	0.010 U
Percent retained 4750 micron sieve (#4)			0.14	0.9	3.11	0.48	1.68	1.4 T	0.010 U
Polycyclic Aromatic Hydrocarbons (µg/kg)									
2-Methylnaphthalene			361 U	29.0 U	7.07 U	6.99 U	5.46 U	6.90 UT	12.7 U
Acenaphthene			181 U	158 J	3.54 U	3.50 U	2.73 U	3.46 UT	4.33 J
Acenaphthylene			181 U	14.5 U	3.54 U	3.50 U	2.73 U	3.46 UT	6.38 U
Anthracene			181 U	17.5	3.54 U	3.50 U	2.73 U	3.46 UT	5.26 J
Benzo(a)anthracene			229 J	64.1	8.01 J	2.70 J	3.08 J	2.84 JT	24.7
Benzo(a)pyrene			279	84.9	14	3.47 J	5.08	4.00 JT	32.5
Benzo(b)fluoranthene			381 J	132 J	18.8 J	4.55 J	6.48 J	5.67 JT	46.1 J
Benzo(g,h,i)perylene			221	145 U	10.4	3.61	4.02	3.72 T	24.7
Benzo(k)fluoranthene			143 J	37.5 J	6.69 J	5.25 U	3.05 J	5.18 UT	16.1 J
Chrysene			241 J	81.8	9.51 J	3.05 J	3.43 J	3.37 JT	29
Dibenzo(a,h)anthracene			181 U	145 U	2.02 J	3.50 U	2.73 U	3.46 UT	4.44 J
Fluoranthene			369	129 J	12.9	4.08	4.57	4.27 T	46.5
Fluorene			181 U	28.4	3.54 U	3.50 U	2.73 U	3.46 UT	3.53 J
Indeno(1,2,3-c,d)pyrene			255	145 U	11.3	3.22 J	3.36	3.63 T	21.8
Naphthalene	140000		361 U	29.0 U	7.07 U	6.99 U	5.46 U	6.90 UT	12.7 U
Phenanthrene			217	76.7	5.41	3.50 U	2.71 J	2.85 JT	19.8
Pyrene			328	126	12.1	5.66	5.14	5.22 T	43.3
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)			524 JT	170 JT	25.5 JT	7.18 JT	9.53 JT	8.26 JT	62.2 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000		458 JT	185 JT	19.9 JT	6.30 JT	7.77 JT	6.97 JT	46.4 JT
PH-ROD Total PAH (U=1/2 max limit)	30000		3480 JT	1190 JT	125 JT	50.5 JT	53.2 JT	53.7 JT	338 JT
Dioxin Furans (µg/kg)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.0000847 U	0.0000930 U	0.000158 U	0.0000841 U	0.000122 U	0.000117 UT	0.000105 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000103 U	0.000154 U	0.000279 U	0.000138 U	0.000179 U	0.000129 UT	0.000133 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000259 U	0.000312 U	0.000508 U	0.000191 U	0.000317 U	0.000228 UT	0.000178 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000347 J	0.00568 J	0.0104	0.00152 J	0.00153 J	0.00380 JT	0.000175 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000284 U	0.000701 J	0.000775 J	0.000365 J	0.000353 U	0.000439 JT	0.000184 U
									0.000487 J

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1							
	T4-PDI2019-SG35	T4-PDI2019-SG36	T4-PDI2019-SG37	T4-PDI2019-SG42	T4-PDI2019-SG43	T4-PDI2019-SG44	T4-PDI2019-SG45	T4-PDI2019-SG46	
	SG35	SG36	SG37	SG42	SG43	SG44	SG45	SG46	
	T4-PDI2019-SG35- 190503	T4-PDI2019-SG36- 190501	T4-PDI2019-SG37- 190430	T4-PDI2019-SG42- 190501	T4-PDI2019-SG43- 190501	T4-PDI2019-SG44- 190501	T4-PDI2019-SG45- 190503	T4-PDI2019-SG46- 190503	
	0 - 27.5 cm	0 - 23 cm	0 - 21.2 cm	0 - 25.2 cm	0 - 25.8 cm	0 - 26 cm	0 - 26.8 cm	0 - 25.8 cm	
	5/3/2019	5/1/2019	4/30/2019	5/1/2019	5/1/2019	5/1/2019	5/3/2019	5/3/2019	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		0.0104	0.226 J	0.237	0.064	0.0526	0.0859 T	0.00456	0.0826 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		0.106	2.68 J	1.96	0.803	0.664	0.860 T	0.0465	0.839 J
Total Tetrachlorodibenzo-p-dioxin (TCDD)		0.0000847 U	0.000323 J	0.000158 U	0.0000841 U	0.000122 U	0.000117 UT	0.000105 U	0.0000890 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)		0.000103 U	0.000400 J	0.000279 U	0.000216	0.000179 U	0.000129 UT	0.000133 U	0.00118 J
Total Hexachlorodibenzo-p-dioxin (HxCDD)		0.00198 J	0.0217 J	0.0295 J	0.00836	0.00595	0.0116 JT	0.000955	0.0128
Total Heptachlorodibenzo-p-dioxin (HpCDD)		0.0233 J	0.441 J	0.394	0.166	0.134	0.151 T	0.0102 J	0.161 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	0.000111 U	0.000131 U	0.000246 J	0.000121 U	0.000123 U	0.000449 JT	0.000156 U	0.00227
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		0.000145 U	0.000147 U	0.00180 J	0.000205 U	0.000250 U	0.00122 JT	0.000154 U	0.00312 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.000137 U	0.000382 J	0.0113	0.000410 J	0.000601 J	0.00634 JT	0.000155 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.04	0.000382 J	0.00242 J	0.0456	0.00126 J	0.00235 J	0.0276 T	0.000173 J	0.0226
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		0.0000886 U	0.000432 J	0.00712	0.000112 U	0.000159 U	0.00466 JT	0.0000615 U	0.00369 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		0.000137 U	0.000210 U	0.00398 J	0.000170 U	0.000240 U	0.00297 JT	0.000103 U	0.00251 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		0.0000895 U	0.000653 J	0.0077	0.000497 J	0.000588 J	0.00453 JT	0.0000618 U	0.00368 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		0.00256 J	0.0580 J	0.102	0.0117	0.0119	0.0395 T	0.00100 J	0.0347 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		0.000175 J	0.00345 J	0.00941	0.000816 J	0.00160 J	0.00534 T	0.000124 U	0.00578
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		0.0128	0.463 J	0.36	0.0859	0.0675	0.0867 T	0.00507 J	0.0947
Total Tetrachlorodibenzofuran (TCDF)		0.000111 U	0.000239 J	0.000802	0.000121 U	0.000123 U	0.000973 T	0.000156 U	0.00486 J
Total Pentachlorodibenzofuran (PeCDF)		0.000481 J	0.00422 J	0.0792 J	0.00222 J	0.00264 J	0.0490 T	0.000155 U	0.0366
Total Hexachlorodibenzofuran (HxCDF)		0.0026	0.0422	0.249	0.0112 J	0.0155 J	0.131 T	0.00113 J	0.105
Total Heptachlorodibenzofuran (HpCDF)		0.0113	0.311 J	0.478	0.0601	0.0589	0.161 T	0.00424	0.145
PCB Congeners (µg/kg)									
<i>Individual congener results available but not shown</i>									
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	0.797 JT	2.95 JT	2.30 JT	0.846 JT	0.918 JT	0.933 JT	0.910 JT
									0.574 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1								
	T4-PDI2019-SG47	T4-PDI2019-SG48	T4-PDI2019-SG49	T4-PDI2019-SG50	T4-PDI2019-SG51	T4-PDI2019-SG52	T4-PDI2019-SG53	T4-PDI2019-SG54		
	SG47	SG48	SG49	SG50	SG51	SG52	SG53	SG54		
	T4-PDI2019-SG47-190503	T4-PDI2019-SG48-190503	T4-PDI2019-SG49-190503	T4-PDI2019-SG50-190418	T4-PDI2019-SG51-190417	T4-PDI2019-SG52-190417	T4-PDI2019-SG53-190416	T4-PDI2019-SG54-190416		
	0 - 28 cm	0 - 27.8 cm	0 - 26.3 cm	0 - 25.8 cm	0 - 29.5 cm	0 - 29.5 cm	0 - 29.5 cm	0 - 24.8 cm		
	5/3/2019	5/3/2019	5/3/2019	4/18/2019	4/17/2019	4/17/2019	4/16/2019	4/16/2019		
	RAL	PTW								
Conventional Parameters (pct)										
Total organic carbon			2.1	2.3	2.2	2.2	2.1	2.2	2.4	0.5
Total solids			41.7	37.9	38	33.8	39	35.2	33.1	70.6
Grain Size (pct)										
Gravel (>2mm)			0.01	0.010 U	0.010 U	0.010 U	0.22	0.01	0.010 U	2.96
Sand (2.0mm – 0.063mm)			11.8	5.85	5.13	1.58	3.24	1.39	3.09	87.1
Silt, 5-63 micron			65.8	72.5	68.4	64.8	65.3	63.2	64.8	7.2
Clay, <5 micron			22.5	21.7	26.5	33.6	31.2	35.4	32.1	2.7
Percent retained 63 micron sieve (#230)			2.15	1.51	0.97	0.5	0.77	0.28	0.38	0.83
Percent retained 75 micron sieve (#200)			2.77	1.66	1.29	0.56	0.82	0.29	0.54	2.27
Percent retained 106 micron sieve (#140)			1.82	0.93	0.94	0.29	0.5	0.23	0.34	3.72
Percent retained 150 micron sieve (#100)			2.11	0.85	1.07	0.11	0.75	0.25	0.47	14.1
Percent retained 250 micron sieve (#60)			2	0.49	0.5	0.09	0.3	0.3	0.56	39.5
Percent retained 425 micron sieve (#40)			0.88	0.4	0.32	0.02	0.11	0.03	0.75	23.6
Percent retained 850 micron sieve (#20)			0.03	0.01	0.03	0.010 U	0.010 U	0.01	0.06	3.04
Percent retained 2000 micron sieve (#10)			0.01	0.010 U	0.010 U	0.010 U	0.04	0.01	0.010 U	1.84
Percent retained 4750 micron sieve (#4)			0.010 U	0.010 U	0.010 U	0.010 U	0.19	0.010 U	0.010 U	1.12
Polycyclic Aromatic Hydrocarbons (µg/kg)										
2-Methylnaphthalene			48.9 U	14.0 U	13.7 U	15.6 UJ	13.4 U	14.4 U	62.7 U	17.0 J
Acenaphthene			24.5 U	7.01 U	6.84 U	7.80 UJ	6.69 U	3.78 J	31.4 U	25.4
Acenaphthylene			24.5 U	3.56 J	6.84 U	7.80 UJ	6.69 U	7.22 U	31.4 U	8.15 J
Anthracene			24.5 U	7.01	6.84 U	7.80 UJ	5.93 J	8.41	31.4 U	32.1
Benzo(a)anthracene			32.2 J	22.1	8.00 J	12.8 J	13.3 J	36	41.0 J	105
Benzo(a)pyrene			41	31.2	12	20.6 J	19	49.6	53.5	149
Benzo(b)fluoranthene			55.3 J	38.8 J	14.4 J	24.9 J	24.1 J	75.7 J	61.9 J	174 J
Benzo(g,h,i)perylene			28.3	25.4	9.53	13.9 J	13.7	31.1	23.0 J	103
Benzo(k)fluoranthene			18.4 J	14.9 J	5.56 J	10.9 J	11.0 J	28.6 J	36.6 J	57.9 J
Chrysene			41.0 J	28.8	9.98 J	14.0 J	20.0 J	47.7	42.0 J	117
Dibenzo(a,h)anthracene			24.5 U	4.32 J	6.84 U	7.80 UJ	6.69 U	7.17 J	31.4 U	22.3
Fluoranthene			50.2	44.8	16.4	18.4 J	30.8	62.8 J	44	184
Fluorene			24.5 U	4.36 J	6.84 U	7.80 UJ	7.57	5.51 J	31.4 U	16.7
Indeno(1,2,3-c,d)pyrene			31.7	21.9	9.98	12.2 J	12.3	34.7	26.5 J	94.3
Naphthalene	140000		48.9 U	14.0 U	13.7 U	15.6 UJ	9.64 J	14.4 U	62.7 U	50.9
Phenanthrene			20.4 J	18.1	5.79 J	8.65 J	16.8	24.7	18.2 J	116
Pyrene			51.5	48.6	17.1	19.5 J	29.9	62.3 J	40.6	192
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)			73.7 JT	53.7 JT	20.0 JT	35.8 JT	35.1 JT	104 JT	98.5 JT	232 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000		65.4 JT	44.0 JT	18.7 JT	29.6 JT	27.4 JT	71.7 JT	82.5 JT	209 JT
PH-ROD Total PAH (U=1/2 max limit)	30000		480 JT	331 JT	140 JT	191 JT	231 JT	496 JT	529 JT	1460 JT
Dioxin Furans (µg/kg)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000211 U	0.000133 U	0.000400 J	0.000153 U	0.000389 J	0.000127 U	0.000128 U	0.000227 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000766 J	0.000198 J	0.000714 J	0.000153 U	0.00111 J	0.000195 U	0.000195 U	0.000271 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00177 J	0.000266 U	0.00154 J	0.000267 U	0.00206 J	0.000313 U	0.000335 U	0.000413 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.0115	0.00205 J	0.00794	0.000474 J	0.00916	0.00109 J	0.00145 J	0.00321 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00359 J	0.000998 J	0.00305 J	0.000279 U	0.00318 J	0.000330 U	0.000305 J	0.000907 J

Table 4-1a
Surface Sediment Data: Open-Water Stations

Abbreviated Location ID	SubArea	Slip 1								
	Location ID	T4-PDI2019-SG47	T4-PDI2019-SG48	T4-PDI2019-SG49	T4-PDI2019-SG50	T4-PDI2019-SG51	T4-PDI2019-SG52	T4-PDI2019-SG53	T4-PDI2019-SG54	
	Sample ID	SG47	SG48	SG49	SG50	SG51	SG52	SG53	SG54	
	Depth	T4-PDI2019-SG47-190503	T4-PDI2019-SG48-190503	T4-PDI2019-SG49-190503	T4-PDI2019-SG50-190418	T4-PDI2019-SG51-190417	T4-PDI2019-SG52-190417	T4-PDI2019-SG53-190416	T4-PDI2019-SG54-190416	
	Sample Date	0 - 28 cm	0 - 27.8 cm	0 - 26.3 cm	0 - 25.8 cm	0 - 29.5 cm	0 - 29.5 cm	0 - 29.5 cm	0 - 24.8 cm	
	RAL	5/3/2019	5/3/2019	5/3/2019	4/18/2019	4/17/2019	4/17/2019	4/16/2019	4/16/2019	
	PTW									
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		0.34	0.0613	0.223	0.00775	0.211	0.0308	0.0469	0.0887
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)			3.29	0.57	2.1	0.0809	1.36	0.427	0.411	0.764
Total Tetrachlorodibenzo-p-dioxin (TCDD)			0.00331 J	0.00104	0.00454 J	0.000153 U	0.00620 J	0.000127 U	0.000128 U	0.000227 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)			0.00718 J	0.00165 J	0.00720 J	0.000365 J	0.00904 J	0.000195 U	0.000195 U	0.000580 J
Total Hexachlorodibenzo-p-dioxin (HxCDD)			0.0696	0.0153	0.0581 J	0.00204 J	0.0667	0.00808 J	0.00937	0.0219
Total Heptachlorodibenzo-p-dioxin (HpCDD)			0.73 J	0.143 J	0.517 J	0.0231	0.507	0.0886	0.118	0.196
2,3,7,8-Tetrachlorodibenzofuran (TCDF)		0.6	0.00168	0.000524 J	0.00144	0.000254 U	0.00121	0.000119 U	0.000150 U	0.000312 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)			0.00225 J	0.000405 J	0.00183 J	0.000314 U	0.00192 J	0.000206 U	0.000540 J	0.000550 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.00732	0.000545 J	0.00237 J	0.000325 U	0.00612	0.000395 J	0.00179 J	0.00361 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.0401	0.00251 J	0.0155	0.000159 U	0.0192	0.00179 J	0.00742	0.0111
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.00715	0.000613 J	0.00333 J	0.000168 U	0.00408 J	0.000412 J	0.00126 J	0.00218 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			0.00379 J	0.000585 J	0.00161 J	0.000254 U	0.00267 J	0.000192 U	0.000776 J	0.000900 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.00667	0.000824 J	0.00318 J	0.000173 U	0.00447 J	0.000430 J	0.00149 J	0.00192 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			0.103	0.013	0.0558	0.00171 J	0.0362	0.00584	0.0123	0.0234
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			0.0123	0.00106 J	0.00567	0.000158 U	0.00595	0.000791 J	0.00201 J	0.00310 J
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			0.36	0.0507	0.233	0.00674 J	0.146	0.0364	0.0321	0.0639
Total Tetrachlorodibenzofuran (TCDF)			0.00658 J	0.00136	0.00906	0.0775 J	0.00902	0.000119 U	0.000150 U	0.00125
Total Pentachlorodibenzofuran (PeCDF)			0.0633	0.00643 J	0.0335 J	0.0216 J	0.0514 J	0.00209 J	0.0153	0.0241 J
Total Hexachlorodibenzofuran (HxCDF)			0.216	0.0189	0.104	0.00336 J	0.134	0.0111 J	0.0371 J	0.064
Total Heptachlorodibenzofuran (HpCDF)			0.434 J	0.0479	0.25	0.00624	0.239	0.0241	0.0496	0.0939
PCB Congeners (µg/kg)										
<i>Individual congener results available but not shown</i>										
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	11.7 JT	0.809 JT	0.470 JT	10.9 JT	0.355 JT	0.638 JT	1.46 JT	15.8 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1							
	T4-PDI2019-SG55	T4-PDI2019-SG56	T4-PDI2019-SG57	T4-PDI2019-SG58	T4-PDI2019-SG59	T4-PDI2019-SG60	T4-PDI2019-SG61	T4-PDI2019-SG62	
	SG55	SG56	SG57	SG58	SG59	SG60	SG61	SG62	
	T4-PDI2019-SG55-190503	T4-PDI2019-SG56-190418	T4-PDI2019-SG57-190417	T4-PDI2019-SG58-190417	T4-PDI2019-SG59-190417	T4-PDI2019-SG60-190417	T4-PDI2019-SG61-190416	T4-PDI2019-SG62-190418	
	0 - 27.8 cm	0 - 24.8 cm	0 - 29.5 cm	0 - 28.5 cm	0 - 29.5 cm	0 - 27.8 cm	0 - 24.8 cm	0 - 25.7 cm	
	5/3/2019	4/18/2019	4/17/2019	4/17/2019	4/17/2019	4/17/2019	4/16/2019	4/18/2019	
	RAL	PTW							
Conventional Parameters (pct)									
Total organic carbon		2.2	2.2	2.3	2.4	2.4	2.3 T	0.87	2
Total solids		39.3	32.9	34.6	34.2	33.8	36.9 T	69.4	37.7
Grain Size (pct)									
Gravel (>2mm)		0.010 U	0.010 U	0.010 U	0.010 U	0.010 UT	0.010 UT	1.83	0.010 U
Sand (2.0mm - 0.063mm)		6.92	3.16	2.47	2.53	3.44 T	10.7 T	89.3	10.9
Silt, 5-63 micron		69.4	67.2	67.2	65.1	65.5 T	59.4 T	7	66.4
Clay, <5 micron		23.7	29.6	30.4	32.3	31.1 T	30.0 T	1.8	22.7
Percent retained 63 micron sieve (#230)		1.76	0.66	0.35	0.44	0.67 T	1.21 T	1.01	2.93
Percent retained 75 micron sieve (#200)		2.08	0.75	0.39	0.52	0.98 T	1.76 T	3.65	3.88
Percent retained 106 micron sieve (#140)		1.13	0.5	0.21	0.31	0.57 T	1.20 T	6.84	2.11
Percent retained 150 micron sieve (#100)		0.96	0.71	0.29	0.32	0.43 T	2.38 T	17.6	1.64
Percent retained 250 micron sieve (#60)		0.61	0.29	0.46	0.34	0.41 T	2.96 T	37.8	0.28
Percent retained 425 micron sieve (#40)		0.36	0.24	0.66	0.53	0.35 T	1.03 T	20.4	0.07
Percent retained 850 micron sieve (#20)		0.01	0.01	0.12	0.06	0.05 T	0.1 T	2.01	0.010 U
Percent retained 2000 micron sieve (#10)		0.010 U	0.010 U	0.010 U	0.010 U	0.010 UT	0.010 UT	1.15	0.010 U
Percent retained 4750 micron sieve (#4)		0.010 U	0.010 U	0.010 U	0.010 U	0.010 UT	0.010 UT	0.68	0.010 U
Polycyclic Aromatic Hydrocarbons (µg/kg)									
2-Methylnaphthalene		13.2 U	15.8 UJ	14.8 UJ	15.0 UJ	15.5 UJ	55.5 UJT	754 U	14.1 UJ
Acenaphthene		6.63 U	7.91 UJ	7.43 UJ	7.49 UJ	7.77 UJ	27.8 UJT	378 U	7.05 UJ
Acenaphthylene		6.63 U	7.91 UJ	7.43 UJ	7.49 UJ	4.09 J	27.8 UJT	378 U	7.05 UJ
Anthracene		6.63 U	7.91 UJ	3.72 J	4.91 J	9.97 J	23.9 JT	378 U	5.66 J
Benzo(a)anthracene		7.06 J	7.27 J	14.7 J	18.3 J	26.4 J	63.7 JT	586 J	16.2 J
Benzo(a)pyrene		11.1	11.1 J	21.2 J	26.5 J	33.9 J	95.7 JT	681	23.6 J
Benzo(b)fluoranthene		12.3 J	12.3 J	30.1 J	42.4 J	54.4 J	127 JT	881 J	31.7 J
Benzo(g,h,i)perylene		5.46 J	5.67 J	15.7 J	19.9 J	27.7 J	66.5 JT	475	19.7 J
Benzo(k)fluoranthene		6.40 J	7.39 J	11.3 J	12.6 J	17.8 J	52.8 JT	336 J	9.83 J
Chrysene		6.85 J	10.3 J	19.7 J	28.2 J	37.4 J	79.6 JT	578 J	24.1 J
Dibenzo(a,h)anthracene		6.63 U	7.91 UJ	7.43 UJ	4.35 J	5.70 J	22.7 JT	378 U	3.73 J
Fluoranthene		9.42	8.16 J	27.6 J	36.1 J	53.6 J	115 JT	765	28.0 J
Fluorene		6.63 U	7.91 UJ	7.43 UJ	7.49 UJ	5.83 J	27.8 UJT	378 U	4.87 J
Indeno(1,2,3-c,d)pyrene		6.37 J	5.33 J	17.1 J	21.5 J	30.0 J	74.7 JT	545	16.4 J
Naphthalene	140000	13.2 U	15.8 UJ	14.8 UJ	15.0 UJ	15.5 UJ	55.5 UJT	754 U	7.95 J
Phenanthrene		4.19 J	4.60 J	12.0 J	13.4 J	19.6 J	46.5 JT	403	16.8 J
Pyrene		10.4	9.66 J	27.1 J	34.6 J	50.1 J	116 JT	749	29.0 J
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		18.7 JT	19.7 JT	41.4 JT	55.0 JT	72.2 JT	180 JT	1220 JT	41.5 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	17.1 JT	17.6 JT	31.2 JT	39.2 JT	50.9 JT	145 JT	1080 JT	33.9 JT
PH-ROD Total PAH (U=1/2 max limit)	30000	109 JT	117 JT	230 JT	289 JT	396 JT	982 JT	7700 JT	252 JT
Dioxin Furans (µg/kg)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000472 J	0.000140 U	0.000115 U	0.000336 U	0.000533 U	0.000158 UT	0.000789 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000634 J	0.000179 U	0.000138 U	0.000458 U	0.000911 J	0.00124 JT	0.00147 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000924 J	0.000291 U	0.000216 U	0.000818 U	0.00284 J	0.00336 JT	0.00275 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00387 J	0.000548 J	0.000233 U	0.00127 J	0.0223 J	0.0164 JT	0.011
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00165 J	0.000311 U	0.000234 U	0.000956 U	0.00595 J	0.00436 JT	0.00470 J
									0.000535 J

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1								
	T4-PDI2019-SG55	T4-PDI2019-SG56	T4-PDI2019-SG57	T4-PDI2019-SG58	T4-PDI2019-SG59	T4-PDI2019-SG60	T4-PDI2019-SG61	T4-PDI2019-SG62		
	SG55	SG56	SG57	SG58	SG59	SG60	SG61	SG62		
	T4-PDI2019-SG55- 190503	T4-PDI2019-SG56- 190418	T4-PDI2019-SG57- 190417	T4-PDI2019-SG58- 190417	T4-PDI2019-SG59- 190417	T4-PDI2019-SG60- 190417	T4-PDI2019-SG61- 190416	T4-PDI2019-SG62- 190418		
	0 - 27.8 cm	0 - 24.8 cm	0 - 29.5 cm	0 - 28.5 cm	0 - 29.5 cm	0 - 27.8 cm	0 - 24.8 cm	0 - 25.7 cm		
	5/3/2019	4/18/2019	4/17/2019	4/17/2019	4/17/2019	4/17/2019	4/16/2019	4/18/2019		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)			0.101	0.0183	0.0188	0.0978	1.31 J	0.877 T	0.34	0.0604
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)			0.876	0.216	0.163	0.771	13.9 J	11.5 JT	3.28	0.781
Total Tetrachlorodibenzo-p-dioxin (TCDD)			0.00434 J	0.000140 U	0.000115 U	0.000336 U	0.00209	0.00168 JT	0.00172 J	0.000151 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)			0.00512 J	0.000314	0.000138 U	0.000783 U	0.00771 J	0.00595 JT	0.00852 J	0.000198 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)			0.0325 J	0.00328	0.00396	0.0209	0.236 J	0.155 T	0.0638	0.00946
Total Heptachlorodibenzo-p-dioxin (HpCDD)			0.246 J	0.0423	0.0522	0.265	3.31 J	2.4 T	0.631	0.128
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6		0.000949	0.000191 U	0.000105 U	0.000446 U	0.000889 J	0.00121 T	0.000816 J	0.000196 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)			0.000849 J	0.000263 U	0.000179 U	0.000567 U	0.00177 J	0.00261 JT	0.000977 J	0.000311 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.00157 J	0.000259 U	0.000174 U	0.000583 U	0.00576 J	0.00279 JT	0.00296 J	0.000277 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.00497	0.000455 J	0.000152 U	0.00114 J	0.0252 J	0.0196 JT	0.0103	0.00235 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.00117 J	0.000199 U	0.000166 U	0.000587 U	0.00505	0.00425 JT	0.00310 J	0.000505 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			0.000875 J	0.000307 U	0.000243 U	0.000906 U	0.00264 J	0.00260 JT	0.000910 J	0.000376 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.00161 J	0.000204 U	0.000158 U	0.000591 U	0.00591	0.00429 JT	0.00413 J	0.000475 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			0.0188	0.00371 J	0.00245 J	0.00929	0.201 J	0.146 T	0.093	0.0156
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			0.00240 J	0.000226 U	0.000105 U	0.000892 U	0.0149 J	0.0107 JT	0.00825	0.00128 J
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			0.0867	0.0207	0.0128	0.0574	1.35 J	1.00 T	0.465	0.0843
Total Tetrachlorodibenzofuran (TCDF)			0.00700 J	0.000191 U	0.000105 U	0.000446 U	0.00395 J	0.00383 JT	0.00946 J	0.000196 U
Total Pentachlorodibenzofuran (PeCDF)			0.0168	0.000540 J	0.000177 U	0.00167	0.0478	0.0330 JT	0.0330 J	0.00342 J
Total Hexachlorodibenzofuran (HxCDF)			0.0486 J	0.00357 J	0.00204 J	0.0103	0.228 J	0.168 JT	0.113 J	0.0176 J
Total Heptachlorodibenzofuran (HpCDF)			0.105	0.0173	0.0104	0.0443	0.982 J	0.726 T	0.382	0.0752
PCB Congeners (µg/kg)										
<i>Individual congener results available but not shown</i>										
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	0.519 JT	3.51 JT	0.461 JT	0.782 JT	7.34 JT	3.71 JT	88.7 JT	3.32 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1	Berth 401	Berth 401	Berth 401
	T4-PDI2019-SG63	T4-PDI2019-SG64	T4-PDI2019-SG66	T4-PDI2019-SG67	T4-PDI2019-SG68
	SG63	SG64	SG66	SG67	SG68
	T4-PDI2019-SG63- 190418	T4-PDI2019-SG64- 190418	T4-PDI2019-SG66- 190502	T4-PDI2019-SG67- 190502	T4-PDI2019-SG68- 190502
	0 - 24.7 cm	0 - 25.2 cm	0 - 24.5 cm	0 - 20.8 cm	0 - 25.5 cm
	4/18/2019	4/18/2019	5/2/2019	5/2/2019	5/2/2019
Conventional Parameters (pct)					
Total organic carbon		2.1	2.1	0.058	0.38
Total solids		34.8	31.2	77.5	70.4
Grain Size (pct)					
Gravel (>2mm)		0.010 U	0.010 U	4.91	1.34
Sand (2.0mm – 0.063mm)		4.27	2.04	92.4	90.4
Silt, 5-63 micron		66.9	68.9	1.3	4.9
Clay, <5 micron		28.8	29.1	1.3	3.4
Percent retained 63 micron sieve (#230)		1.11	0.52	0.12	0.31
Percent retained 75 micron sieve (#200)		1.32	0.6	0.23	0.67
Percent retained 106 micron sieve (#140)		0.85	0.39	0.72	1.48
Percent retained 150 micron sieve (#100)		0.78	0.41	9.54	17.7
Percent retained 250 micron sieve (#60)		0.14	0.07	48.6	54
Percent retained 425 micron sieve (#40)		0.06	0.04	30.7	15.5
Percent retained 850 micron sieve (#20)		0.01	0.01	2.52	0.77
Percent retained 2000 micron sieve (#10)		0.010 U	0.010 U	1.41	0.59
Percent retained 4750 micron sieve (#4)		0.010 U	0.010 U	3.5	0.75
Polycyclic Aromatic Hydrocarbons (µg/kg)					
2-Methylnaphthalene		15.0 UJ	16.4 UJ	6.76 U	29.1 U
Acenaphthene		7.51 UJ	8.21 UJ	3.39 U	14.6 U
Acenaphthylene		7.51 UJ	8.21 UJ	3.39 U	14.6 U
Anthracene		7.51 UJ	8.21 UJ	2.89 J	14.6 U
Benzo(a)anthracene		14.4 J	10.9 J	2.45 J	20.6 J
Benzo(a)pyrene		20.7 J	16.7 J	3.90 J	28.9
Benzo(b)fluoranthene		26.5 J	21.2 J	5.24 J	38.5 J
Benzo(g,h,i)perylene		14.5 J	12.2 J	2.46 J	22.3
Benzo(k)fluoranthene		11.5 J	10.6 J	2.72 J	11.5 J
Chrysene		16.8 J	13.3 J	4.75 J	25.7 J
Dibenzo(a,h)anthracene		7.51 UJ	8.21 UJ	3.39 U	14.6 U
Fluoranthene		22.8 J	19.7 J	4.7	32.2
Fluorene		7.51 UJ	8.21 UJ	3.39 U	14.6 U
Indeno(1,2,3-c,d)pyrene		13.2 J	11.4 J	1.74 J	19.2
Naphthalene	140000	15.0 UJ	16.4 UJ	6.76 U	29.1 U
Phenanthrene		9.12 J	8.12 J	2.38 J	11.9 J
Pyrene		24.0 J	19.4 J	7.71	55.6
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		38.0 JT	31.8 JT	7.96 JT	50.0 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	30.0 JT	25.3 JT	6.57 JT	44.2 JT
PH-ROD Total PAH (U=1/2 max limit)	30000	207 JT	180 JT	54.5 JT	332 JT
Dioxin Furans (µg/kg)					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000134 U	0.000167 U	0.0000864 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000308 U	0.000193 U	0.000436 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000719 J	0.000433 U	0.00216 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00383 J	0.000460 U	0.0292
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00123 J	0.000471 U	0.00456
					0.00137 J
					0.00202 J

Table 4-1a
Surface Sediment Data: Open-Water Stations

	SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 1	Slip 1	Berth 401	Berth 401	Berth 401
		T4-PDI2019-SG63	T4-PDI2019-SG64	T4-PDI2019-SG66	T4-PDI2019-SG67	T4-PDI2019-SG68
		SG63	SG64	SG66	SG67	SG68
		T4-PDI2019-SG63- 190418	T4-PDI2019-SG64- 190418	T4-PDI2019-SG66- 190502	T4-PDI2019-SG67- 190502	T4-PDI2019-SG68- 190502
		0 - 24.7 cm	0 - 25.2 cm	0 - 24.5 cm	0 - 20.8 cm	0 - 25.5 cm
		4/18/2019	4/18/2019	5/2/2019	5/2/2019	5/2/2019
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		0.124	0.0233	1.27	0.143	0.147
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		1.45	0.245	14.2 J	1.77	1.18
Total Tetrachlorodibenzo-p-dioxin (TCDD)		0.000567	0.000167 U	0.0000864 U	0.000384	0.00315 J
Total Pentachlorodibenzo-p-dioxin (PeCDD)		0.000458 J	0.000193 U	0.00149	0.00236 J	0.00492 J
Total Hexachlorodibenzo-p-dioxin (HxCDD)		0.0219 J	0.00306 J	0.111	0.0233	0.0369
Total Heptachlorodibenzo-p-dioxin (HpCDD)		0.269	0.059	2.6	0.292 J	0.327 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	0.000223 U	0.000161 U	0.000106 U	0.000183 J	0.00111
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		0.000670 J	0.000201 U	0.000143 U	0.000200 J	0.00102 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.000787 J	0.000182 U	0.000142 U	0.000447 J	0.000879 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.04	0.00388 J	0.000660 J	0.00258 J	0.00171 J	0.00293 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		0.000976 J	0.000122 U	0.000264 U	0.000440 J	0.00106 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		0.000378 J	0.000189 U	0.000390 U	0.000529 J	0.000925 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		0.00128 J	0.000131 U	0.00151 J	0.000830 J	0.00125 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		0.0301	0.00428 J	0.276	0.0303	0.0234
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		0.00208 J	0.000328 J	0.0117	0.00200 J	0.00190 J
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		0.172	0.0241	2.25	0.192	0.117
Total Tetrachlorodibenzofuran (TCDF)		0.0177 J	0.000161 U	0.000106 U	0.000183 J	0.00640 J
Total Pentachlorodibenzofuran (PeCDF)		0.0114 J	0.000892	0.00238	0.00456 J	0.0126 J
Total Hexachlorodibenzofuran (HxCDF)		0.0318	0.00452 J	0.171	0.0293	0.0431
Total Heptachlorodibenzofuran (HpCDF)		0.143	0.0197 J	1.59	0.149	0.133
PCB Congeners (µg/kg)						
<i>Individual congener results available but not shown</i>						
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	0.262 JT	0.681 JT	0.430 JT	20.5 JT
						0.180 JT

Table 4-1a
Surface Sediment Data: Open-Water Stations

Notes:

- Detected concentration is greater than the RAL
- Detected concentration is greater than the PTW threshold
- Non-detected concentration is above one or more identified screening levels

Bold: Detected result

J: Estimated value

T: Calculated or averaged result

U: Compound analyzed but not detected above detection limit

UJ: Compound analyzed but not detected above estimated detection limit

UT: Compound analyzed for but not detected above detection limit (calculated result)

UJT: Compound analyzed for but not detected above estimated detection limit (calculated result)

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cm: centimeter

cPAH: carcinogenic polycyclic aromatic hydrocarbon

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

T4: Terminal 4

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-1b
Surface Sediment Data: Underpier Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 3	Slip 1	Slip 1					
	T4-PDI2019-SG21	T4-PDI2019-SG22	T4-PDI2019-SG23	T4-PDI2019-SG24	T4-PDI2019-SG25	T4-PDI2019-SG26	T4-PDI2019-SG38	T4-PDI2019-SG40
	SG21	SG22	SG23	SG24	SG25	SG26	SG38	SG40
	T4-PDI2019-SG21- 190531	T4-PDI2019-SG22- 190529	T4-PDI2019-SG23- 190529	T4-PDI2019-SG24- 190529	T4-PDI2019-SG25- 190529	T4-PDI2019-SG26- 190530	T4-PDI2019-SG38- 190531	T4-PDI2019-SG40- 190528
	0 - 27.8 cm	0 - 26.5 cm	0 - 26.3 cm	0 - 25 cm	0 - 27.3 cm	0 - 26.2 cm	0 - 26.3 cm	0 - 29 cm
	5/31/2019	5/29/2019	5/29/2019	5/29/2019	5/29/2019	5/30/2019	5/31/2019	5/28/2019
	RAL	PTW						
Conventional Parameters (pct)								
Total organic carbon		0.68	0.32	0.39	0.19	1	4.6	0.038
Total solids		63.4	73.5	72.6	70.5	67.9	62	73
Grain Size (pct)								
Gravel (>2mm)		1.07	0.44	0.49	6.42	6.77	14.2	0.12
Sand (2.0mm - 0.063mm)		77.5	90.9	91.4	89.6	84.6	65.3	98.1
Silt, 5-63 micron		17.1	6.6	6	3.1	6.9	16.3	1.7
Clay, <5 micron		4.3	2.1	2	1	1.7	4.3	0.1
Percent retained 63 micron sieve (#230)		2.22	0.98	0.67	0.22	0.75	1.96	0.11
Percent retained 75 micron sieve (#200)		4.42	2.83	1.83	0.66	2.11	5.66	0.3
Percent retained 106 micron sieve (#140)		4.12	4.63	3.4	1.55	3.86	5.92	0.81
Percent retained 150 micron sieve (#100)		15	24.4	21	15.1	18.6	13.8	17.7
Percent retained 250 micron sieve (#60)		39.1	47.7	51.6	52.8	40.6	22.5	61.5
Percent retained 425 micron sieve (#40)		12.2	10.2	12.6	17.7	14.8	7.92	17.2
Percent retained 850 micron sieve (#20)		0.35	0.26	0.29	1.62	3.96	7.48	0.49
Percent retained 2000 micron sieve (#10)		0.82	0.26	0.13	2.16	4.01	5.91	0.12
Percent retained 4750 micron sieve (#4)		0.25	0.18	0.36	4.27	2.76	8.24	0.010 U
Polycyclic Aromatic Hydrocarbons (µg/kg)								
2-Methylnaphthalene		323 U	284 U	289 U	296 U	77000 U	84100 U	7.21 U
Acenaphthene		255	180	881	810	36800 J	132000	24.9
Acenaphthylene		162 U	142 U	145 U	148 U	38500 U	42100 U	3.61 U
Anthracene		252	204	750	660 J	24200 J	104000	3.21 J
Benzo(a)anthracene		1810	1260	4670	4250	163000 J	630000	14.3
Benzo(a)pyrene		2600	1880	7500	5840	210000	964000	19.9
Benzo(b)fluoranthene		3270 J	2230 J	8590 J	6910 J	266000 J	1130000 J	30.7
Benzo(g,h,i)perylene		1720	1250	4640	3840	151000	613000	15.6
Benzo(k)fluoranthene		1270 J	878 J	3300 J	2280 J	119000 J	487000 J	9.76
Chrysene		2100	1490	5040	4320 J	194000 J	736000	16
Dibenzo(a,h)anthracene		355	228	975	808	33900 J	124000	3.30 J
Fluoranthene		3570	2170	7040	5960 J	237000	995000	19.7
Fluorene		144 J	96.3 J	323	260	38500 U	54100	3.61 U
Indeno(1,2,3-c,d)pyrene		1770	1290	4770	3810	181000	681000	14.6
Naphthalene	140000	323 U	284 U	190 J	149 J	77000 U	84100 U	7.21 U
Phenanthrene		1430	944	3220	2510 J	119000	518000	7.99
Pyrene		3480	2260	7080	5890 J	238000	977000	19.9
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		4540 JT	3110 JT	12000 JT	9190 JT	385000 JT	1620000 JT	40.5 T
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	3700 JT	2600 JT	10000 JT	8170 JT	310000 JT	1300000 JT	29.3 JT
PH-ROD Total PAH (U=1/2 max limit)	30000	24000 JT	17000 JT	59000 JT	49000 JT	210000 JT	8300000 JT	211 JT
Dioxin Furans (µg/kg)								
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	--	--	0.000142 U	--	--	0.000107 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	--	--	0.000232 U	--	--	0.000142 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	--	0.000715 J	--	--	0.000352 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	--	0.00282 J	--	--	0.00666
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	--	0.00132 J	--	--	0.000763 J

Table 4-1b
Surface Sediment Data: Underpier Stations

Abbreviated Location ID	SubArea	Slip 3	Slip 1	Slip 1						
	Location ID	T4-PDI2019-SG21	T4-PDI2019-SG22	T4-PDI2019-SG23	T4-PDI2019-SG24	T4-PDI2019-SG25	T4-PDI2019-SG26	T4-PDI2019-SG38	T4-PDI2019-SG40	
	Sample ID	SG21	SG22	SG23	SG24	SG25	SG26	SG38	SG40	
	Depth	T4-PDI2019-SG21- 190531	T4-PDI2019-SG22- 190529	T4-PDI2019-SG23- 190529	T4-PDI2019-SG24- 190529	T4-PDI2019-SG25- 190529	T4-PDI2019-SG26- 190530	T4-PDI2019-SG38- 190531	T4-PDI2019-SG40- 190528	
	Sample Date	0 - 27.8 cm 5/31/2019	0 - 26.5 cm 5/29/2019	0 - 26.3 cm 5/29/2019	0 - 25 cm 5/29/2019	0 - 27.3 cm 5/29/2019	0 - 26.2 cm 5/30/2019	0 - 26.3 cm 5/31/2019	0 - 29 cm 5/28/2019	
	RAL									
	PTW									
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		--	--	0.0954	--	--	--	0.123	0.0243 J	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		--	--	0.935	--	--	--	1.07	0.234 J	
Total Tetrachlorodibenzo-p-dioxin (TCDD)		--	--	0.000675	--	--	--	0.000107 U	0.000131 U	
Total Pentachlorodibenzo-p-dioxin (PeCDD)		--	--	0.00141 J	--	--	--	0.000142 U	0.000170 U	
Total Hexachlorodibenzo-p-dioxin (HxCDD)		--	--	0.0299 J	--	--	--	0.0198	0.00530 J	
Total Heptachlorodibenzo-p-dioxin (HpCDD)		--	--	0.264	--	--	--	0.229	0.0499 J	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	--	--	0.000542 J	--	--	--	0.000221 J	0.000110 U	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		--	--	0.000742 J	--	--	--	0.00165 J	0.000356 J	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	--	0.000739 J	--	--	--	0.0105	0.00122 J	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.04	--	--	0.00324 J	--	--	--	0.0366	0.00535	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		--	--	0.000650 J	--	--	--	0.00557	0.000781 J	
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		--	--	0.000512 J	--	--	--	0.00345 J	0.000675 J	
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		--	--	0.000986 J	--	--	--	0.00672	0.00104 J	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		--	--	0.0097	--	--	--	0.059	0.00779 J	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		--	--	0.000905 J	--	--	--	0.00807	0.00143 J	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		--	--	0.025	--	--	--	0.131	0.0141 J	
Total Tetrachlorodibenzofuran (TCDF)		--	--	0.00113	--	--	--	0.000836 J	0.000249 J	
Total Pentachlorodibenzofuran (PeCDF)		--	--	0.0107 J	--	--	--	0.0691	0.00951	
Total Hexachlorodibenzofuran (HxCDF)		--	--	0.0232 J	--	--	--	0.187	0.0262 J	
Total Heptachlorodibenzofuran (HpCDF)		--	--	0.0353	--	--	--	0.243 J	0.0311 J	
PCB Congeners (µg/kg)										
<i>Individual congener results available but not shown</i>										
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	17.4 JT	10.0 JT	11.0 JT	73.1 JT	23.9 JT	243 JT	1.57 JT	0.177 JT

Table 4-1b
Surface Sediment Data: Underpier Stations

Abbreviated Location ID	SubArea	Slip 1	
	Location ID	T4-PDI2019-SG41	
		SG41	
	Sample ID	T4-PDI2019-SG41-190528	
	Depth	0 - 27.3 cm	
	Sample Date	5/28/2019	
	RAL		
	PTW		
Conventional Parameters (pct)			
Total organic carbon			0.12 T
Total solids			70.3 T
Grain Size (pct)			
Gravel (>2mm)			3.26 T
Sand (2.0mm – 0.063mm)			81.3 T
Silt, 5-63 micron			10.1 T
Clay, <5 micron			5.40 T
Percent retained 63 micron sieve (#230)			0.990 T
Percent retained 75 micron sieve (#200)			2.12 T
Percent retained 106 micron sieve (#140)			2.73 T
Percent retained 150 micron sieve (#100)			10.2 T
Percent retained 250 micron sieve (#60)			38.7 T
Percent retained 425 micron sieve (#40)			24.5 T
Percent retained 850 micron sieve (#20)			2.01 T
Percent retained 2000 micron sieve (#10)			0.55 T
Percent retained 4750 micron sieve (#4)			2.71 T
Polycyclic Aromatic Hydrocarbons (µg/kg)			
2-Methylnaphthalene			45.2 JT
Acenaphthene			122 T
Acenaphthylene			2.41 JT
Anthracene			25.7 T
Benzo(a)anthracene			130 T
Benzo(a)pyrene			81.8 T
Benzo(b)fluoranthene			123 JT
Benzo(g,h,i)perylene			19.8 T
Benzo(k)fluoranthene			54.2 JT
Chrysene			113 JT
Dibenzo(a,h)anthracene			7.39 JT
Fluoranthene			116 T
Fluorene			55.9 T
Indeno(1,2,3-c,d)pyrene			29.7 T
Naphthalene	140000		107 T
Phenanthrene			192 T
Pyrene			107 T
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)			178 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000		120 JT
PH-ROD Total PAH (U=1/2 max limit)	30000		1300 JT
Dioxin Furans (µg/kg)			
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000220 UT
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000156 JT
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000447 UJT
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00260 JT
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000502 UT

Table 4-1b
Surface Sediment Data: Underpier Stations

Abbreviated Location ID	SubArea	Slip 1	
	Location ID	T4-PDI2019-SG41	
	Sample ID	SG41	
	Depth	T4-PDI2019-SG41- 190528	
	Sample Date	0 - 27.3 cm 5/28/2019	
	RAL	PTW	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)			0.0820 T
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)			0.80 T
Total Tetrachlorodibenzo-p-dioxin (TCDD)			0.000220 UT
Total Pentachlorodibenzo-p-dioxin (PeCDD)			0.000459 JT
Total Hexachlorodibenzo-p-dioxin (HxCDD)			0.0174 JT
Total Heptachlorodibenzo-p-dioxin (HpCDD)			0.19 T
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6		0.000174 UT
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)			0.000536 JT
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.00354 JT
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.0181 T
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.00334 JT
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			0.00185 JT
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.00290 JT
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			0.0250 T
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			0.00436 JT
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			0.0360 T
Total Tetrachlorodibenzofuran (TCDF)			0.000174 UT
Total Pentachlorodibenzofuran (PeCDF)			0.0241 JT
Total Hexachlorodibenzofuran (HxCDF)			0.0814 JT
Total Heptachlorodibenzofuran (HpCDF)			0.0824 JT
PCB Congeners (µg/kg)			
<i>Individual congener results available but not shown</i>			
PH-ROD Total PCB Congener (U=1/2 max limit)	75	200	303 JT

Table 4-1b
Surface Sediment Data: Underpier Stations

Notes:

- Detected concentration is greater than the RAL
- Detected concentration is greater than the PTW threshold
- Non-detected concentration is above one or more identified screening levels

Bold: Detected result

J: Estimated value

T: Calculated or averaged result

U: Compound analyzed but not detected above detection limit

UU: Compound analyzed but not detected above estimated detection limit

UT: Compound analyzed for but not detected above detection limit (calculated result)

UJT: Compound analyzed for but not detected above estimated detection limit (calculated result)

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cm: centimeter

cPAH: carcinogenic polycyclic aromatic hydrocarbon

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

T4: Terminal 4

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2a
Surface Sediment Data Summary Statistics: Berth 414

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	2	2	2	0	2.3	2.5	--	0	0	--	--	--	--	0
Total solids	2	2	2	0	42.3	43.1	--	0	0	--	--	--	--	0
Grain Size (pct)														
Gravel (>2mm)	2	2	1	1	0.05	0.05	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	2	2	2	0	22.4	29.6	--	0	0	--	--	--	--	0
Silt, 5-63 micron	2	2	2	0	54	56.3	--	0	0	--	--	--	--	0
Clay, <5 micron	2	2	2	0	16.4	21.3	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Acenaphthene	2	2	1	1	17	17	--	0	0	--	--	--	--	0
Acenaphthylene	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Anthracene	2	2	1	1	23.4	23.4	--	0	0	--	--	--	--	0
Benzo(a)anthracene	2	2	2	0	130	372	--	0	0	--	--	--	--	0
Benzo(a)pyrene	2	2	2	0	169	565	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	2	2	2	0	224	718	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	2	2	2	0	127	379	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	2	2	2	0	79.3	282	--	0	0	--	--	--	--	0
Chrysene	2	2	2	0	159	489	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	2	2	1	1	28.3	28.3	--	0	0	--	--	--	--	0
Fluoranthene	2	2	2	0	234	686	--	0	0	--	--	--	--	0
Fluorene	2	2	1	1	16.5	16.5	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	2	2	2	0	107	364	--	0	0	--	--	--	--	0
Naphthalene	2	2	0	2	--	--	--	0	0	--	--	--	140000	0
Phenanthrene	2	2	2	0	125	377	--	0	0	--	--	--	--	0
Pyrene	2	2	2	0	213	666	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	2	2	2	0	303	1000	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	2	2	2	0	240	836	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	2	2	2	0	1700	6000	30000	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
Individual congener results available but not shown														
PH-ROD Total PCB Congener (U=1/2 max limit)	2	2	2	0	0.442	0.492	75	0	0	--	--	--	200	0

Notes:

µg/kg: micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2b
Surface Sediment Data Summary Statistics: Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	14	14	14	0	0.063	1.9	--	0	0	--	--	--	--	0
Total solids	14	14	14	0	45.9	75.8	--	0	0	--	--	--	--	0
Grain Size (pct)														
Gravel (>2mm)	14	14	14	0	0.03	7.98	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	14	14	14	0	44.7	95.4	--	0	0	--	--	--	--	0
Silt, 5-63 micron	14	14	14	0	1.9	40	--	0	0	--	--	--	--	0
Clay, <5 micron	14	14	14	0	0.4	15.2	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	14	14	2	12	17.1	329	--	0	0	--	--	--	--	0
Acenaphthene	14	14	4	10	19.7	252	--	0	0	--	--	--	--	0
Acenaphthylene	14	14	4	10	9.6	788	--	0	0	--	--	--	--	0
Anthracene	14	14	9	5	45.7	6370	--	0	0	--	--	--	--	0
Benzo(a)anthracene	14	14	14	0	19.3	8980	--	0	0	--	--	--	--	0
Benzo(a)pyrene	14	14	14	0	29.2	12300	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	14	14	14	0	30.2	10900	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	14	14	14	0	17.3	7850	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	14	14	14	0	15.5	3910	--	0	0	--	--	--	--	0
Chrysene	14	14	14	0	19.4	10300	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	14	14	8	6	35.6	1030	--	0	0	--	--	--	--	0
Fluoranthene	14	14	14	0	32.1	25500	--	0	0	--	--	--	--	0
Fluorene	14	14	7	7	20.1	2090	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	14	14	14	0	16.3	6900	--	0	0	--	--	--	--	0
Naphthalene	14	14	7	7	29.1	1850	--	0	0	--	--	--	140000	0
Phenanthrene	14	14	14	0	16	19200	--	0	0	--	--	--	--	0
Pyrene	14	14	14	0	35.6	31000	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	14	14	14	0	46	14800	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	14	14	14	0	43.1	16000	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	14	14	14	0	295	150000	30000	1	0	--	--	5	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	5	5	0	5	--	--	0.0006	0	0	--	--	0.01	0	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	5	5	3	2	0.000305	0.0009	0.0008	1	0	--	--	1.1	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	5	5	4	1	0.000609	0.00185	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	5	5	5	0	0.000365	0.00742	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	5	5	4	1	0.00122	0.00363	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	5	5	5	0	0.00812	0.226	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	5	5	5	0	0.0794	2.69	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	5	5	3	2	0.000611	0.00345	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	5	5	4	1	0.000558	0.00707	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	5	5	5	0	0.00216	0.0675	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	5	5	5	0	0.0172	0.639	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	5	5	3	2	0.000427	0.00115	--	0	0	--	--	0.6	0	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	5	5	4	1	0.00043	0.00129	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	5	5	4	1	0.000471	0.0015	0.2	0	0	--	--	0.2	0	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	5	5	5	0	0.000146	0.00865	--	0	0	--	--	0.04	0	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	5	5	4	1	0.000622	0.00276	--	0	0	--	--	--	--	0

Table 4-2b
Surface Sediment Data Summary Statistics: Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	5	5	3	2	0.000446	0.00113	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	5	5	4	1	0.00067	0.00264	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	5	5	5	0	0.00139	0.033	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	5	5	4	1	0.000732	0.0032	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	5	5	5	0	0.00371	0.111	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	5	5	3	2	0.000967	0.0102	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	5	5	5	0	0.000372	0.0214	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	5	5	5	0	0.00188	0.066	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	5	5	5	0	0.00401	0.108	--	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
Individual congener results available but not shown														
PH-ROD Total PCB Congener (U=1/2 max limit)	14	14	14	0	0.597	11.5	75	0	0	--	--	--	200	0

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2c
Surface Sediment Data Summary Statistics: Underpier Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	6	6	6	0	0.19	4.6	--	0	0	--	--	--	--	0
Total solids	6	6	6	0	62	73.5	--	0	0	--	--	--	--	0
Grain Size (pct)														
Gravel (>2mm)	6	6	6	0	0.44	14.2	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	6	6	6	0	65.3	91.4	--	0	0	--	--	--	--	0
Silt, 5-63 micron	6	6	6	0	3.1	17.1	--	0	0	--	--	--	--	0
Clay, <5 micron	6	6	6	0	1	4.3	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	6	6	0	6	--	--	--	0	0	--	--	--	--	0
Acenaphthene	6	6	6	0	180	132000	--	0	0	--	--	--	--	0
Acenaphthylene	6	6	0	6	--	--	--	0	0	--	--	--	--	0
Anthracene	6	6	6	0	204	104000	--	0	0	--	--	--	--	0
Benzo(a)anthracene	6	6	6	0	1260	630000	--	0	0	--	--	--	--	0
Benzo(a)pyrene	6	6	6	0	1880	964000	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	6	6	6	0	2230	1130000	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	6	6	6	0	1250	613000	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	6	6	6	0	878	487000	--	0	0	--	--	--	--	0
Chrysene	6	6	6	0	1490	736000	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	6	6	6	0	228	124000	--	0	0	--	--	--	--	0
Fluoranthene	6	6	6	0	2170	995000	--	0	0	--	--	--	--	0
Fluorene	6	6	5	1	96.3	54100	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	6	6	6	0	1290	681000	--	0	0	--	--	--	--	0
Naphthalene	6	6	2	4	149	190	--	0	0	--	--	--	140000	0
Phenanthrene	6	6	6	0	944	518000	--	0	0	--	--	--	--	0
Pyrene	6	6	6	0	2260	977000	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	6	6	6	0	3110	1620000	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	6	6	6	0	2600	1300000	--	0	0	--	--	--	774000	1
PH-ROD Total PAH (U=1/2 max limit)	6	6	6	0	17000	8300000	30000	4	0	59	59	280	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1	1	0	1	--	--	0.0006	0	0	--	--	--	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	1	1	0	1	--	--	0.0008	0	0	--	--	--	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	1	1	1	0	0.000715	0.000715	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	1	1	1	0	0.00282	0.00282	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	1	1	1	0	0.00132	0.00132	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1	1	1	0	0.0954	0.0954	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	1	1	1	0	0.935	0.935	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	1	1	1	0	0.000675	0.000675	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	1	1	1	0	0.00141	0.00141	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	1	1	1	0	0.0299	0.0299	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	1	1	1	0	0.264	0.264	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	1	1	1	0	0.000542	0.000542	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	1	1	1	0	0.000742	0.000742	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	1	1	1	0	0.000739	0.000739	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	1	1	1	0	0.00324	0.00324	--	0	0	--	--	--	0.04	0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	1	1	1	0	0.00065	0.00065	--	0	0	--	--	--	--	0

Table 4-2c
Surface Sediment Data Summary Statistics: Underpier Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	1	1	1	0	0.000512	0.000512	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	1	1	1	0	0.000986	0.000986	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	1	1	1	0	0.0097	0.0097	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	1	1	1	0	0.000905	0.000905	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	1	1	1	0	0.025	0.025	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	1	1	1	0	0.00113	0.00113	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	1	1	1	0	0.0107	0.0107	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	1	1	1	0	0.0232	0.0232	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	1	1	1	0	0.0353	0.0353	--	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
Individual congener results available but not shown														
PH-ROD Total PCB Congener (U=1/2 max limit)	6	6	6	0	10	243	75	1	0	--	--	3.2	200	1

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2d
Surface Sediment Data Summary Statistics: Wheeler Bay

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (ppt)														
Total organic carbon	8	8	8	0	0.076	3.4	--	0	0	--	--	--	--	0
Total solids	8	8	8	0	41.2	79	--	0	0	--	--	--	--	0
Grain Size (ppt)														
Gravel (>2mm)	8	8	4	4	0.02	2.95	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	8	8	8	0	10.6	94.1	--	0	0	--	--	--	--	0
Silt, 5-63 micron	8	8	8	0	1.1	68.3	--	0	0	--	--	--	--	0
Clay, <5 micron	8	8	8	0	1.8	21.1	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	8	8	0	8	--	--	--	0	0	--	--	--	--	0
Acenaphthene	8	8	1	7	15.5	15.5	--	0	0	--	--	--	--	0
Acenaphthylene	8	8	0	8	--	--	--	0	0	--	--	--	--	0
Anthracene	8	8	3	5	16	135	--	0	0	--	--	--	--	0
Benzo(a)anthracene	8	8	8	0	8.93	842	--	0	0	--	--	--	--	0
Benzo(a)pyrene	8	8	8	0	24.7	1120	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	8	8	8	0	33.4	1440	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	8	8	8	0	18.3	816	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	8	8	8	0	15	549	--	0	0	--	--	--	--	0
Chrysene	8	8	8	0	18.5	893	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	8	8	3	5	13.2	165	--	0	0	--	--	--	--	0
Fluoranthene	8	8	8	0	12.1	1180	--	0	0	--	--	--	--	0
Fluorene	8	8	2	6	14.7	131	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	8	8	8	0	14.3	880	--	0	0	--	--	--	--	0
Naphthalene	8	8	0	8	--	--	--	0	0	--	--	--	140000	0
Phenanthrene	8	8	7	1	23.8	533	--	0	0	--	--	--	--	0
Pyrene	8	8	8	0	12.8	1180	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	8	8	8	0	48.4	1990	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	8	8	8	0	37.3	1600	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	8	8	8	0	225	11000	30000	0	0	--	--	--	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	6	6	1	5	0.000239	0.000239	0.0006	0	0	--	--	--	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	6	6	2	4	0.000405	0.000729	0.0008	0	0	--	--	--	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	6	6	3	3	0.000867	0.00123	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	6	6	6	0	0.000552	0.00567	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	6	6	5	1	0.000718	0.00256	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	6	6	6	0	0.0168	0.268	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	6	6	6	0	0.157	2	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	6	6	4	2	0.000451	0.00226	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	6	6	4	2	0.000776	0.00656	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	6	6	6	0	0.00346	0.0863	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	6	6	6	0	0.0651	0.854	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	6	6	3	3	0.000879	0.00221	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	6	6	2	4	0.00111	0.002	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	6	6	4	2	0.000406	0.00172	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	6	6	5	1	0.000676	0.00394	--	0	0	--	--	--	0.04	0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	6	6	4	2	0.00054	0.0012	--	0	0	--	--	--	--	0

Table 4-2d
Surface Sediment Data Summary Statistics: Wheeler Bay

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect and non-detects/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	6	6	2	4	0.000426	0.000851	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	6	6	5	1	0.000485	0.00144	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	6	6	6	0	0.00178	0.0232	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	6	6	4	2	0.000767	0.00247	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	6	6	6	0	0.00623	0.0824	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	6	6	4	2	0.000711	0.00582	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	6	6	6	0	0.000343	0.0135	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	6	6	6	0	0.0018	0.0417	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	6	6	6	0	0.00647	0.107	--	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
<i>Individual congener results available but not shown</i>														
PH-ROD Total PCB Congener (U=1/2 max limit)	8	8	8	0	0.44	23.4	75	0	0	--	--	--	200	0

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2e
Surface Sediment Data Summary Statistics: Slip 1

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	26	26	26	0	0.083	2.4	--	0	0	--	--	--	--	0
Total solids	26	26	26	0	31.2	97.1	--	0	0	--	--	--	--	0
Grain Size (pct)														
Gravel (>2mm)	26	26	12	14	0.01	3.68	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	26	26	26	0	1.39	94	--	0	0	--	--	--	--	0
Silt, 5-63 micron	26	26	26	0	2.9	72.5	--	0	0	--	--	--	--	0
Clay, <5 micron	26	26	26	0	0.8	35.4	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	26	26	1	25	17	17	--	0	0	--	--	--	--	0
Acenaphthene	26	26	4	22	3.78	158	--	0	0	--	--	--	--	0
Acenaphthylene	26	26	3	23	3.56	8.15	--	0	0	--	--	--	--	0
Anthracene	26	26	12	14	2.05	32.1	--	0	0	--	--	--	--	0
Benzo(a)anthracene	26	26	26	0	2.7	586	--	0	0	--	--	--	--	0
Benzo(a)pyrene	26	26	26	0	3.47	681	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	26	26	26	0	4.55	881	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	26	26	25	1	3.61	475	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	26	26	24	2	3.05	336	--	0	0	--	--	--	--	0
Chrysene	26	26	26	0	3.05	578	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	26	26	10	16	2.02	22.7	--	0	0	--	--	--	--	0
Fluoranthene	26	26	26	0	4.08	765	--	0	0	--	--	--	--	0
Fluorene	26	26	9	17	1.94	28.4	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	26	26	25	1	3.22	545	--	0	0	--	--	--	--	0
Naphthalene	26	26	3	23	7.95	50.9	--	0	0	--	--	--	140000	0
Phenanthrene	26	26	25	1	2.71	403	--	0	0	--	--	--	--	0
Pyrene	26	26	26	0	5.14	749	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	26	26	26	0	7.18	1220	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	26	26	26	0	6.3	1080	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	26	26	26	0	50.5	7700	30000	0	0	--	--	--	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	26	26	3	23	0.000389	0.000472	0.0006	0	1	--	--	--	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	26	26	9	17	0.000198	0.00147	0.0008	4	0	1	--	1.8	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	26	26	8	18	0.000719	0.00336	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	26	26	23	3	0.000347	0.0223	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	26	26	17	9	0.000305	0.00595	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	26	26	26	0	0.00456	1.31	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	26	26	26	0	0.0465	13.9	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	26	26	10	16	0.000323	0.0062	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	26	26	15	11	0.000216	0.00904	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	26	26	26	0	0.000955	0.236	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	26	26	26	0	0.0102	3.31	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	26	26	11	15	0.000246	0.00227	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	26	26	14	12	0.000405	0.00312	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	26	26	19	7	0.000277	0.0113	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	26	26	24	2	0.000173	0.0456	--	0	0	--	--	--	0.04	2
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	26	26	17	9	0.000412	0.00715	--	0	0	--	--	--	--	0

Table 4-2e
Surface Sediment Data Summary Statistics: Slip 1

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	26	26	15	11	0.000376	0.00398	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	26	26	19	7	0.00043	0.0077	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	26	26	26	0	0.001	0.201	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	26	26	21	5	0.000175	0.0149	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	26	26	26	0	0.00507	1.35	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	26	26	15	11	0.000239	0.0775	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	26	26	24	2	0.000481	0.0792	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	26	26	26	0	0.00113	0.249	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	26	26	26	0	0.00424	0.982	--	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
Individual congener results available but not shown														
PH-ROD Total PCB Congener (U=1/2 max limit)	26	26	26	0	0.262	88.7	75	1	0	--	--	1.2	200	0

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2f
Surface Sediment Data Summary Statistics: Underpier Slip 1

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	3	3	3	0	0.038	0.3	--	0	0	--	--	--	--	0
Total solids	3	3	3	0	67.5	73	--	0	0	--	--	--	--	0
Grain Size (pct)														
Gravel (>2mm)	3	3	3	0	0.02	3.26	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	3	3	3	0	59.2	98.1	--	0	0	--	--	--	--	0
Silt, 5-63 micron	3	3	3	0	1.7	32.6	--	0	0	--	--	--	--	0
Clay, <5 micron	3	3	3	0	0.1	8.1	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	3	3	1	2	45.2	45.2	--	0	0	--	--	--	--	0
Acenaphthene	3	3	3	0	8.4	122	--	0	0	--	--	--	--	0
Acenaphthylene	3	3	1	2	2.41	2.41	--	0	0	--	--	--	--	0
Anthracene	3	3	2	1	3.21	25.7	--	0	0	--	--	--	--	0
Benzo(a)anthracene	3	3	3	0	2.09	130	--	0	0	--	--	--	--	0
Benzo(a)pyrene	3	3	2	1	19.9	81.8	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	3	3	2	1	30.7	123	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	3	3	2	1	15.6	19.8	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	3	3	2	1	9.76	54.2	--	0	0	--	--	--	--	0
Chrysene	3	3	2	1	16	113	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	3	3	2	1	3.3	7.39	--	0	0	--	--	--	--	0
Fluoranthene	3	3	3	0	2.08	116	--	0	0	--	--	--	--	0
Fluorene	3	3	1	2	55.9	55.9	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	3	3	2	1	14.6	29.7	--	0	0	--	--	--	--	0
Naphthalene	3	3	2	1	9.66	107	--	0	0	--	--	--	140000	0
Phenanthrene	3	3	3	0	2.1	192	--	0	0	--	--	--	--	0
Pyrene	3	3	3	0	2.07	107	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	3	3	2	1	40.5	178	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	3	3	3	0	5.41	120	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	3	3	3	0	51.8	1300	30000	0	0	--	--	--	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	3	3	0	3	--	--	0.0006	0	0	--	--	--	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	3	3	1	2	0.000156	0.000156	0.0008	0	0	--	--	--	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	0	3	--	--	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	3	0	0.00106	0.00666	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	1	2	0.000763	0.000763	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3	3	3	0	0.0243	0.123	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3	3	3	0	0.234	1.07	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	3	3	0	3	--	--	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	3	3	1	2	0.000459	0.000459	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	3	0	0.0053	0.0198	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	3	3	3	0	0.0499	0.229	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	3	3	1	2	0.000221	0.000221	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	3	3	3	0	0.000356	0.00165	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	3	3	3	0	0.00122	0.0105	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.00535	0.0366	--	0	0	--	--	--	0.04	0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.000781	0.00557	--	0	0	--	--	--	--	0

Table 4-2f
Surface Sediment Data Summary Statistics: Underpier Slip 1

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/non-detects/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.000675	0.00345	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.00104	0.00672	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	3	3	3	0	0.00779	0.059	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	3	3	3	0	0.00143	0.00807	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	3	3	3	0	0.0141	0.131	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	3	3	2	1	0.000249	0.000836	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	3	3	3	0	0.00951	0.0691	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.0262	0.187	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	3	3	3	0	0.0311	0.243	--	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
Individual congener results available but not shown														
PH-ROD Total PCB Congener (U=1/2 max limit)	3	3	3	0	0.177	303	75	1	0	1.4	1.4	4	200	1

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 4-2g
Surface Sediment Data Summary Statistics: Berth 401

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (ppt)														
Total organic carbon	3	3	3	0	0.058	2.2	--	0	0	--	--	--	--	0
Total solids	3	3	3	0	41.1	77.5	--	0	0	--	--	--	--	0
Grain Size (ppt)														
Gravel (>2mm)	3	3	3	0	0.02	4.91	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	3	3	3	0	15.5	92.4	--	0	0	--	--	--	--	0
Silt, 5-63 micron	3	3	3	0	1.3	64.2	--	0	0	--	--	--	--	0
Clay, <5 micron	3	3	3	0	1.3	20.2	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	3	3	0	3	--	--	--	0	0	--	--	--	--	0
Acenaphthene	3	3	0	3	--	--	--	0	0	--	--	--	--	0
Acenaphthylene	3	3	0	3	--	--	--	0	0	--	--	--	--	0
Anthracene	3	3	1	2	2.89	2.89	--	0	0	--	--	--	--	0
Benzo(a)anthracene	3	3	3	0	2.45	26.9	--	0	0	--	--	--	--	0
Benzo(a)pyrene	3	3	3	0	3.9	28.9	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	3	3	3	0	5.24	38.8	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	3	3	3	0	2.46	22.4	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	3	3	2	1	2.72	11.5	--	0	0	--	--	--	--	0
Chrysene	3	3	3	0	4.75	34.4	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	3	3	0	3	--	--	--	0	0	--	--	--	--	0
Fluoranthene	3	3	3	0	4.7	66	--	0	0	--	--	--	--	0
Fluorene	3	3	0	3	--	--	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	3	3	3	0	1.74	23.4	--	0	0	--	--	--	--	0
Naphthalene	3	3	0	3	--	--	--	0	0	--	--	--	140000	0
Phenanthrene	3	3	3	0	2.38	41.9	--	0	0	--	--	--	--	0
Pyrene	3	3	3	0	7.71	63.4	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	3	3	3	0	7.96	57.7	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	3	3	3	0	6.57	50.2	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	3	3	3	0	54.5	478	30000	0	0	--	--	--	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	3	3	1	2	0.000353	0.000353	0.0006	0	0	--	--	--	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	3	3	3	0	0.000254	0.000713	0.0008	0	0	--	--	--	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	3	0	0.000833	0.00216	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	3	0	0.00398	0.0292	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	3	0	0.00137	0.00456	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	3	3	3	0	0.143	1.27	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3	3	3	0	1.18	14.2	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	3	3	2	1	0.000384	0.00315	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	3	3	3	0	0.00149	0.00492	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	3	3	3	0	0.0233	0.111	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	3	3	3	0	0.292	2.6	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	3	3	2	1	0.000183	0.00111	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	3	3	2	1	0.0002	0.00102	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	3	3	2	1	0.000447	0.000879	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.00171	0.00293	--	0	0	--	--	--	0.04	0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	3	3	2	1	0.00044	0.00106	--	0	0	--	--	--	--	0

Table 4-2g
Surface Sediment Data Summary Statistics: Berth 401

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/non-detects/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	3	3	2	1	0.000529	0.000925	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.00083	0.00151	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	3	3	3	0	0.0234	0.276	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	3	3	3	0	0.0019	0.0117	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	3	3	3	0	0.117	2.25	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	3	3	2	1	0.000183	0.0064	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	3	3	3	0	0.00238	0.0126	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	3	3	3	0	0.0293	0.171	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	3	3	3	0	0.133	1.59	--	0	0	--	--	--	--	0
PCB Congeners (µg/kg)														
Individual congener results available but not shown														
PH-ROD Total PCB Congener (U=1/2 max limit)	3	3	3	0	0.18	20.5	75	0	0	--	--	--	200	0

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Berth 414	Berth 414	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3
Location ID	T4-PDI2019-SC03	T4-PDI2019-SC03	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC13	T4-PDI2019-SC13	T4-PDI2019-SC13	T4-PDI2019-SC13	T4-PDI2019-SC13
Abbreviated Location ID	SC03	SC03	SC12	SC12	SC12	SC12	SC13	SC13	SC13	SC13	SC13
Sample ID	T4-PDI2019-SC03-190521-01-03	T4-PDI2019-SC03-190521-03-05	T4-PDI2019-SC12-190521-01-03	T4-PDI2019-SC12-190521-03-05	T4-PDI2019-SC12-190521-05-07	T4-PDI2019-SC12-190521-07-8.3	T4-PDI2019-SC13-190521-01-03	T4-PDI2019-SC13-190521-03-05	T4-PDI2019-SC13-190521-05-07	T4-PDI2019-SC13-190521-07-09	T4-PDI2019-SC13-190521-07-09
Depth	1 - 3 ft	3 - 5 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 8.3 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft	
Sample Date	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019
RAL											
PTW											
Conventional Parameters (pct)											
Total organic carbon			1.7	2	1.4	2	0.88	0.028	1.9	1.1	0.042
Total solids			60.7	68.9	60.1	57.2	72.1	83.6	58	67.2	72.9
Grain Size (pct)											
Gravel (>2mm)			2.42	3.11	0.34	0.16	0.35	0.9	0.28	1.18	0.010 U
Sand (2.0mm – 0.063mm)			37.4	58.3	57.9	43.2	78.1	95.8	38.2	69.4	88.9
Silt, 5-63 micron			42.4	29.9	29.4	39.9	15.2	2.1	42.9	21.8	8.2
Clay, <5 micron			17.9	8.7	12.4	16.7	6.4	1.2	18.6	7.7	2.9
Percent retained 63 micron sieve (#230)			3.07	1.66	1.54	2.16	0.8	0.26	2.14	3.6	2.22
Percent retained 75 micron sieve (#200)			5.6	2.69	2.95	4.1	1.66	0.63	4.35	8.33	8.52
Percent retained 106 micron sieve (#140)			4.89	2.18	3.33	3.85	2.38	1.33	4.96	11.7	21.1
Percent retained 150 micron sieve (#100)			4.86	4.46	11.4	8.64	13.2	12.9	10.7	24.9	50.9
Percent retained 250 micron sieve (#60)			10.1	20.6	26.5	17.1	45	55	11.8	15.3	5.97
Percent retained 425 micron sieve (#40)			7.44	21.4	10.8	6.63	14.5	23.2	3.83	4.97	0.14
Percent retained 850 micron sieve (#20)			1.41	5.28	1.23	0.67	0.48	2.4	0.52	0.56	0.01
Percent retained 2000 micron sieve (#10)			1.02	2.77	0.31	0.11	0.11	0.59	0.16	0.45	0.010 U
Percent retained 4750 micron sieve (#4)			1.41	0.34	0.03	0.05	0.24	0.31	0.13	0.73	0.010 U
Polycyclic Aromatic Hydrocarbons (µg/kg)											
2-Methylnaphthalene			394	1510	350 U	183 J	158 J	6.37 U	336 J	314 U	7.26 U
Acenaphthene			460	1910 U	438	1120	1930	3.19 U	4390	809	3.64 U
Acenaphthylene			175 U	405 U	223	124 J	145 U	3.19 U	179 U	89.9 J	3.64 U
Anthracene			170 J	1590	870	1080	1720	3.19 U	3750	700	3.64 U
Benzo(a)anthracene			504	1980	4070	6710	10700	3.19 U	29200	4450	3.64 U
Benzo(a)pyrene			789	2050	5580	9120	14200	4.78 U	35400	6010	5.45 U
Benzo(b)fluoranthene			681 J	1750 J	5780 J	10600 J	16300 J	4.78 U	41700 J	7100 J	5.45 U
Benzo(g,h,i)perylene			512	1480	3960	5950	8890	3.19 U	23000	4110	3.64 U
Benzo(k)fluoranthene			257 J	573 J	2220 J	3550 J	6320 J	4.78 U	13700 J	2640 J	5.45 U
Chrysene			552	3200	4280	6980	10900	3.19 U	30200	4980	3.64 U
Dibenzo(a,h)anthracene			175 U	209	663	1290	2060	3.19 U	5440	870	3.64 U
Fluoranthene			1170 J	4250	7570	9770	14900	3.19 U	38000	7020	3.64 U
Fluorene			306	1570	368	599	734	3.19 U	1610	372	3.64 U
Indeno(1,2,3-c,d)pyrene			436	1080	3610	5830	8800	3.19 U	23500	3930	3.64 U
Naphthalene	140000		863	1370	541	646	446	6.37 U	637	336	7.26 U
Phenanthrene			1100 J	7950	3460	4840	6720	3.19 U	15700	3210	4.27
Pyrene			1350 J	6730	8630	9720	14200	3.19 U	36500	7070	3.64 U
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)			938 JT	2320 JT	8000 JT	14200 JT	22600 JT	4.78 UT	55400 JT	9700 JT	5.45 UT
PH-ROD Total cPAH/BaP Eq TEQ (USEPA 1993) (U=1/2 max limit)	774000		1040 JT	2700 JT	7620 JT	12800 JT	20000 JT	4.78 UT	50400 JT	8500 JT	5.45 UT
PH-ROD Total PAH (U=1/2 max limit)	30000		9700 JT	38000 JT	52000 JT	78100 JT	120000 JT	6.37 UT	300000 JT	54000 JT	39.7 T
Pesticides (µg/kg)											
2,4'-DDD (o,p'-DDD)			2.81 J	6.81 U	--	--	--	--	--	--	--
2,4'-DDE (o,p'-DDE)			3.05 U	5.24 U	--	--	--	--	--	--	--
2,4'-DDT (o,p'-DDT)			3.05 U	5.24 U	--	--	--	--	--	--	--
4,4'-DDD (p,p'-DDD)			10.8	24.2	--	--	--	--	--	--	--
4,4'-DDE (p,p'-DDE)			5.86	9.69	--	--	--	--	--	--	--
4,4'-DDT (p,p'-DDT)			19.8	66	--	--	--	--	--	--	--
Aldrin			3.05 U	5.24 U	--	--	--	--	--	--	--
Dieldrin			3.05 U	5.24 U	--	--	--	--	--	--	--
Hexachlorocyclohexane (BHC), gamma- (Lindane)			3.05 U	5.24 U	--	--	--	--	--	--	--
PH-ROD Total DDX (U=1/2 max limit)	160	7050	42.3 JT	109 T	--	--	--	--	--	--	--
Dioxin Furans (µg/kg)											
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	--	--	0.000352 U	0.000716 J	0.000394 J	0.000197 U	0.000215 U	0.000858 J	0.000215 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	--	--	0.00120 J	0.00213 J	0.00110 J	0.000143 U	0.000240 J	0.00149 J	0.000245 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			--	--	0.00185 J	0.00745	0.00190 J	0.000235 U	0.000507 J	0.00303 J	0.000277 U
											0.000204 UT

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Berth 414	Berth 414	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	
	T4-PDI2019-SC03	T4-PDI2019-SC03	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC12	T4-PDI2019-SC13	T4-PDI2019-SC13	T4-PDI2019-SC13	T4-PDI2019-SC13	
Abbreviated Location ID	SC03	SC03	SC12	SC12	SC12	SC12	SC13	SC13	SC13	SC13	SC13	
Sample ID	T4-PDI2019-SC03-190521-01-03	T4-PDI2019-SC03-190521-03-05	T4-PDI2019-SC12-190521-01-03	T4-PDI2019-SC12-190521-03-05	T4-PDI2019-SC12-190521-05-07	T4-PDI2019-SC12-190521-07-8.3	T4-PDI2019-SC13-190521-01-03	T4-PDI2019-SC13-190521-03-05	T4-PDI2019-SC13-190521-05-07	T4-PDI2019-SC13-190521-07-09	T4-PDI2019-SC13-190521-07-09	
Depth	1 - 3 ft	3 - 5 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 8.3 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft		
Sample Date	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	
RAL												
PTW												
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			--	--	0.00808	0.0373	0.0108	0.000234 U	0.00231 J	0.0195	0.000277 U	0.000204 UT
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			--	--	0.00337 J	0.0155	0.00428 J	0.000253 U	0.000797 J	0.00741	0.000280 U	0.000214 UT
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)			--	--	0.254	2.31	0.244	0.000809 J	0.0455	0.372	0.000576 J	0.000707 JT
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)			--	--	3.06	15.8 J	2.62	0.00705 J	0.391	3.44	0.00477 J	0.00555 JT
Total Tetrachlorodibenzo-p-dioxin (TCDD)			--	--	0.00342	0.00541 J	0.00211 J	0.000197 U	0.000327 J	0.00477 J	0.000215 U	0.000339 T
Total Pentachlorodibenzo-p-dioxin (PeCDD)			--	--	0.00963 J	0.0222 J	0.00945 J	0.000143 U	0.00128 J	0.0131 J	0.000245 U	0.000128 UT
Total Hexachlorodibenzo-p-dioxin (HxCDD)			--	--	0.0805 J	0.418	0.0851	0.000371 J	0.0163 J	0.118 J	0.000584 J	0.000454 JT
Total Heptachlorodibenzo-p-dioxin (HpCDD)			--	--	0.653	4.29	0.718	0.00187	0.112	0.798	0.0015	0.00178 T
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	--	--	0.00105	0.00256	0.0025	0.000144 U	0.000693 J	0.00283	0.000163 U	0.000131 UT	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		--	--	0.00195 J	0.00257 J	0.00177 J	0.000154 U	0.000919 J	0.00434 J	0.000230 U	0.000120 UT	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	--	--	0.00137 J	0.00298 J	0.00120 J	0.000144 U	0.000428 J	0.00296 J	0.000210 U	0.000118 UT
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	--	--	0.00888	0.0106	0.00479 J	0.000104 U	0.00264 J	0.0104	0.0000726 U	0.0000717 UT
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			--	--	0.00248 J	0.00396 J	0.00215 J	0.000105 U	0.000924 J	0.00417 J	0.0000706 U	0.0000738 UT
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			--	--	0.00116 J	0.000943 J	0.000847 J	0.000173 U	0.000366 J	0.00103 J	0.000118 U	0.0000988 UT
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			--	--	0.00219 J	0.00398 J	0.00197 J	0.000112 U	0.000530 J	0.00335 J	0.0000749 U	0.0000770 UT
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			--	--	0.0336	0.0987	0.0285	0.000186 U	0.00616	0.0462	0.000119 U	0.0000910 UT
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			--	--	0.00323 J	0.00795	0.00242 J	0.000187 U	0.00109 J	0.00397 J	0.000118 U	0.000100 UT
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			--	--	0.0908	0.444	0.0807	0.000272 U	0.0135	0.109	0.000172 U	0.000196 UT
Total Tetrachlorodibenzofuran (TCDF)			--	--	0.00688 J	0.0182	0.00997	0.000144 U	0.00191 J	0.0185	0.000163 U	0.000131 UT
Total Pentachlorodibenzofuran (PeCDF)			--	--	0.0243	0.036	0.0204	0.000149 U	0.00706	0.0424	0.000220 U	0.000119 UT
Total Hexachlorodibenzofuran (HxCDF)			--	--	0.0613	0.123 J	0.0565 J	0.000122 U	0.0147 J	0.0932 J	0.0000832 U	0.0000799 UT
Total Heptachlorodibenzofuran (HpCDF)			--	--	0.112	0.406	0.099	0.000187 U	0.0219	0.151	0.000119 U	0.0000951 UT
PCB Aroclors ($\mu\text{g}/\text{kg}$)												
Aroclor 1016			--	--	6.28 U	6.64 U	5.12 U	4.69 U	6.62 U	5.62 U	5.25 U	5.23 UT
Aroclor 1221			--	--	6.28 U	6.64 U	5.12 U	4.69 U	6.62 U	5.62 U	5.25 U	5.23 UT
Aroclor 1232			--	--	6.28 U	6.64 U	5.12 U	4.69 U	6.62 U	5.62 U	5.25 U	5.23 UT
Aroclor 1242			--	--	6.28 U	4.85 J	3.17 J	4.69 U	5.98 J	12.9 J	5.25 U	5.23 UT
Aroclor 1248			--	--	6.28 U	6.64 U	5.12 U	4.69 U	6.62 U	5.62 U	5.25 U	5.23 UT
Aroclor 1254			--	--	6.28 J	14.1 J	11.5 J	4.69 U	16.0 J	27.5 J	5.25 U	5.23 UT
Aroclor 1260			--	--	6.76 J	12.6 J	12.5 J	4.69 U	14.1 J	36.2 J	5.25 U	5.23 UT
PH-ROD Total PCB Aroclors ($U=1/2$ max limit)	75	200	--	--	28.7 JT	44.8 JT	37.4 JT	4.69 UT	49.3 JT	87.8 JT	5.25 UT	5.23 UT

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3
Location ID	T4-PDI2019-SC13	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC19	T4-PDI2019-SC19	T4-PDI2019-SC19	T4-PDI2019-SC19
Abbreviated Location ID	SC13	SC18	SC18	SC18	SC18	SC18	SC18	SC19	SC19	SC19	SC19
Sample ID	T4-PDI2019-SC13-190521-09-11.1	T4-PDI2019-SC18-190522-01-03	T4-PDI2019-SC18-190522-03-05	T4-PDI2019-SC18-190522-05-07	T4-PDI2019-SC18-190522-07-09	T4-PDI2019-SC18-190522-09-11	T4-PDI2019-SC18-190522-11-13	T4-PDI2019-SC19-190521-01-03	T4-PDI2019-SC19-190521-03-05	T4-PDI2019-SC19-190521-05-07	T4-PDI2019-SC19-190521-05-07
Depth	9 - 11.1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft	9 - 11 ft	11 - 13 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	
Sample Date	5/21/2019	5/22/2019	5/22/2019	5/22/2019	5/22/2019	5/22/2019	5/22/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019
RAL											
PTW											
Conventional Parameters (pct)											
Total organic carbon			0.2	0.18	0.25	0.052 T	0.096	0.12	0.13	0.49 T	0.56
Total solids			70.8	68.8	70.4	74.2 T	68.9	69.6	70.5	68.4 T	67.5
Grain Size (pct)											
Gravel (>2mm)			0.010 U	36.5	0.02						
Sand (2.0mm - 0.063mm)			33.7	47.2	44.9	87.2	70	54.8	68.3	31.1	28
Silt, 5-63 micron			55.1	42.6	44.6	10.6	23.3	33.9	23.6	27	58.3
Clay, <5 micron			11.2	10.2	10.5	2.3	6.7	11.2	8	5.4	13.7
Percent retained 63 micron sieve (#230)			8.69	9.8	9.08	2.84	6.58	7.86	5.46	3.02	7.33
Percent retained 75 micron sieve (#200)			13.1	20.2	17.1	9.06	17.2	19	14.9	4.57	11.6
Percent retained 106 micron sieve (#140)			7.15	13.2	11.7	17.8	21.9	18.1	21.4	2.65	6.68
Percent retained 150 micron sieve (#100)			4.41	3.86	6.02	45.8	22.6	9.42	25.3	5.29	1.93
Percent retained 250 micron sieve (#60)			0.3	0.2	0.9	11.7	1.68	0.35	1.32	7.84	0.29
Percent retained 425 micron sieve (#40)			0.07	0.03	0.06	0.06	0.02	0.03	0.02	4.9	0.16
Percent retained 850 micron sieve (#20)			0.01	0.010 U	0.02	0.01	0.010 U	0.010 U	0.010 U	2.81	0.02
Percent retained 2000 micron sieve (#10)			0.010 U	4.86	0.01						
Percent retained 4750 micron sieve (#4)			0.010 U	31.6	0.01						
Polycyclic Aromatic Hydrocarbons (µg/kg)											
2-Methylnaphthalene			7.42 U	7.42 U	4.06 J	6.72 UT	7.43 U	7.43 U	7.39 U	30.3 UT	7.83 U
Acenaphthene			3.72 U	3.72 U	3.38 J	3.37 UT	3.72 U	3.72 U	3.70 U	94.1 T	3.92 U
Acenaphthylene			3.72 U	3.72 U	3.63 U	3.37 UT	3.72 U	3.72 U	3.70 U	15.2 UT	3.92 U
Anthracene			3.72 U	3.72 U	4.19	3.37 UT	3.72 U	3.72 U	3.70 U	96.3 T	3.92 U
Benz(a)anthracene			3.72 U	3.72 U	3.99	3.37 UT	3.72 U	3.72 U	3.70 U	590 JT	3.92 U
Benz(a)pyrene			5.57 U	5.57 U	4.61 J	5.05 UT	5.58 U	5.57 U	5.55 U	775 T	5.88 U
Benz(b)fluoranthene			5.57 U	5.57 U	4.59 J	5.05 UT	5.58 U	5.57 U	5.55 U	954 JT	5.88 U
Benz(g,h,i)perylene			3.72 U	3.72 U	2.67 J	3.37 UT	3.72 U	3.72 U	3.70 U	533 T	3.92 U
Benz(k)fluoranthene			5.57 U	5.57 U	5.43 U	5.05 UT	5.58 U	5.57 U	5.55 U	403 JT	5.88 U
Chrysene			3.72 U	3.72 U	2.58 J	3.37 UT	3.72 U	3.72 U	3.70 U	697 JT	3.92 U
Dibenzo(a,h)anthracene			3.72 U	3.72 U	3.63 U	3.37 UT	3.72 U	3.72 U	3.70 U	109 T	3.92 U
Fluoranthene			3.72 U	3.72 U	11.5	3.37 UT	3.72 U	3.72 U	3.70 U	972 T	3.92 U
Fluorene			3.72 U	3.72 U	2.82 J	3.37 UT	3.72 U	3.72 U	3.70 U	13.1 JT	3.92 U
Indeno(1,2,3-c,d)pyrene			3.72 U	3.72 U	2.70 J	3.37 UT	3.72 U	3.72 U	3.70 U	589 T	3.92 U
Naphthalene	140000	7.42 U	7.42 U	10.1	6.72 UT	7.43 U	7.43 U	7.39 U	18.6 JT	7.83 U	7.59 U
Phenanthrene		3.72 U	3.72 U	13.6	3.37 UT	3.72 U	3.72 U	3.70 U	499 T	3.92 U	3.80 U
Pyrene		3.72 U	3.72 U	10.2	3.37 UT	3.72 U	3.72 U	3.70 U	1010 T	3.92 U	3.80 U
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		5.57 UT	5.57 UT	7.31 JT	5.05 UT	5.58 UT	5.57 UT	5.55 UT	1360 JT	5.88 UT	5.69 UT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	5.57 UT	5.57 UT	7.58 JT	5.05 UT	5.58 UT	5.57 UT	5.55 UT	1100 JT	5.88 UT	5.69 UT
PH-ROD Total PAH (U=1/2 max limit)	30000	7.42 UT	7.42 UT	87.3 JT	6.72 UT	7.43 UT	7.43 UT	7.39 UT	7400 JT	7.83 UT	7.59 UT
Pesticides (µg/kg)											
2,4'-DDD (o,p'-DDD)		--	--	--	--	--	--	--	--	--	--
2,4'-DDE (o,p'-DDE)		--	--	--	--	--	--	--	--	--	--
2,4'-DDT (o,p'-DDT)		--	--	--	--	--	--	--	--	--	--
4,4'-DDD (p,p'-DDD)		--	--	--	--	--	--	--	--	--	--
4,4'-DDE (p,p'-DDE)		--	--	--	--	--	--	--	--	--	--
4,4'-DDT (p,p'-DDT)		--	--	--	--	--	--	--	--	--	--
Aldrin		--	--	--	--	--	--	--	--	--	--
Dieldrin		--	--	--	--	--	--	--	--	--	--
Hexachlorocyclohexane (BHC), gamma- (Lindane)		--	--	--	--	--	--	--	--	--	--
PH-ROD Total DDX (U=1/2 max limit)	160	7050	--	--	--	--	--	--	--	--	--
Dioxin Furans (µg/kg)											
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000145 U	--	--	--	--	--	0.000152 UT	0.000135 U	0.000137 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000276 U	--	--	--	--	--	0.000267 UT	0.000218 U	0.000133 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000236 U	--	--	--	--	--	0.000269 UT	0.000334 U	0.000227 U

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Location ID	Slip 3										
		T4-PDI2019-SC13	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC18	T4-PDI2019-SC19	T4-PDI2019-SC19	T4-PDI2019-SC19	
Abbreviated Location ID	SC13	SC18	SC18	SC18	SC18	SC18	SC18	SC19	SC19	SC19	SC19	
	T4-PDI2019-SC13-190521-09-11.1	T4-PDI2019-SC18-190522-01-03	T4-PDI2019-SC18-190522-03-05	T4-PDI2019-SC18-190522-05-07	T4-PDI2019-SC18-190522-07-09	T4-PDI2019-SC18-190522-09-11	T4-PDI2019-SC18-190522-11-13	T4-PDI2019-SC19-190521-01-03	T4-PDI2019-SC19-190521-03-05	T4-PDI2019-SC19-190521-05-07	T4-PDI2019-SC19-190521-05-07	
Sample ID	9 - 11.1 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft	9 - 11 ft	11 - 13 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft		
	5/21/2019	5/22/2019	5/22/2019	5/22/2019	5/22/2019	5/22/2019	5/22/2019	5/21/2019	5/21/2019	5/21/2019	5/21/2019	
Depth RAL	Sample Date PTW											
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		0.000253 U	--	--	--	--	--	--	0.000264 UT	0.000328 U	0.000230 U	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		0.000256 U	--	--	--	--	--	--	0.000278 UT	0.000314 U	0.000224 U	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		0.000656 J	--	--	--	--	--	--	0.00437 JT	0.00144 J	0.000195 U	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		0.00657 J	--	--	--	--	--	--	0.0330 T	0.0126	0.00232 J	
Total Tetrachlorodibenzo-p-dioxin (TCDD)		0.000627	--	--	--	--	--	--	0.000152 UT	0.000641	0.000137 U	
Total Pentachlorodibenzo-p-dioxin (PeCDD)		0.000276 U	--	--	--	--	--	--	0.000267 UT	0.000218 U	0.000133 U	
Total Hexachlorodibenzo-p-dioxin (HxCDD)		0.000593	--	--	--	--	--	--	0.00263 T	0.00106	0.000227 U	
Total Heptachlorodibenzo-p-dioxin (HpCDD)		0.00182	--	--	--	--	--	--	0.0114 T	0.00422	0.000345 J	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	0.000177 U	--	--	--	--	--	--	0.000123 UT	0.000148 U	0.0000970 U	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		0.000246 U	--	--	--	--	--	--	0.000194 UT	0.000140 U	0.000152 U	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.000234 U	--	--	--	--	--	0.000185 UT	0.000145 U	0.000140 U	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.0000690 U	--	--	--	--	--	0.00261 JT	0.0000830 U	0.0000869 U	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)		0.0000740 U	--	--	--	--	--	--	0.0000757 UT	0.0000842 U	0.0000888 U	
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)		0.000120 U	--	--	--	--	--	--	0.000126 UT	0.000115 U	0.000117 U	
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)		0.0000769 U	--	--	--	--	--	--	0.0000768 UT	0.0000859 U	0.0000878 U	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)		0.000102 U	--	--	--	--	--	--	0.000889 JT	0.0000927 U	0.0000851 U	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)		0.000100 U	--	--	--	--	--	--	0.000110 UT	0.000105 U	0.0000983 U	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)		0.000173 U	--	--	--	--	--	--	0.00150 JT	0.000251 U	0.000194 U	
Total Tetrachlorodibenzofuran (TCDF)		0.000177 U	--	--	--	--	--	--	0.000123 UT	0.000148 U	0.0000970 U	
Total Pentachlorodibenzofuran (PeCDF)		0.000240 U	--	--	--	--	--	--	0.000189 UT	0.000142 U	0.000146 U	
Total Hexachlorodibenzofuran (HxCDF)		0.0000843 U	--	--	--	--	--	--	0.00110 JT	0.0000914 U	0.0000944 U	
Total Heptachlorodibenzofuran (HpCDF)		0.000101 U	--	--	--	--	--	--	0.00141 T	0.0000985 U	0.0000914 U	
PCB Aroclors ($\mu\text{g}/\text{kg}$)												
Aroclor 1016		5.38 U	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	5.50 UT	5.77 U	5.73 U	
Aroclor 1221		5.38 U	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	5.50 UT	5.77 U	5.73 U	
Aroclor 1232		5.38 U	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	5.50 UT	5.77 U	5.73 U	
Aroclor 1242		5.38 U	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	5.50 UT	5.77 U	5.73 U	
Aroclor 1248		5.38 U	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	5.50 UT	5.77 U	5.73 U	
Aroclor 1254		8.83 J	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	3.15 JT	5.77 U	5.73 U	
Aroclor 1260		5.38 U	5.73 U	5.52 U	5.12 UT	5.78 U	5.67 U	5.67 U	5.50 UT	5.77 U	5.73 U	
PH-ROD Total PCB Aroclors ($U=1/2$ max limit)	75	200	25.0 JT	5.73 UT	5.52 UT	5.12 UT	5.78 UT	5.67 UT	5.67 UT	19.7 JT	5.77 UT	5.73 UT

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Location ID	Slip 3	Slip 3	Slip 3	Wheeler Bay	Wheeler Bay	Wheeler Bay	Wheeler Bay	Wheeler Bay	Wheeler Bay	Wheeler Bay	
		T4-PDI2019-SC19	T4-PDI2019-SC19	T4-PDI2019-SC19	T4-PDI2019-SC27	T4-PDI2019-SC27	T4-PDI2019-SC27	T4-PDI2019-SC28	T4-PDI2019-SC28	T4-PDI2019-SC29	T4-PDI2019-SC29	
Abbreviated Location ID	SC19	SC19	SC19	SC27	SC27	SC27	SC28	SC28	SC28	SC29	SC29	
	T4-PDI2019-SC19-190521-07-09	T4-PDI2019-SC19-190521-09-11	T4-PDI2019-SC19-190521-11-11.8	T4-PDI2019-SC27-190524-01-03	T4-PDI2019-SC27-190524-03-05	T4-PDI2019-SC27-190524-05-07	T4-PDI2019-SC28-190524-07-09	T4-PDI2019-SC28-190524-09-10.1	T4-PDI2019-SC29-190524-01-03	T4-PDI2019-SC29-190524-03-05		
Sample ID	7 - 9 ft	9 - 11 ft	11 - 11.8 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft	9 - 10.1 ft	1 - 3 ft	3 - 5 ft		
	5/21/2019	5/21/2019	5/21/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019		
Depth RAL	Sample Date PTW											
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		0.000458 U	0.000361 U	0.000412 U	0.000981 J	0.00827	0.0451 T	0.00513	0.00901	0.00480 J	0.00175 JT	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)		0.000501 U	0.000328 U	0.000460 U	0.000373 U	0.00320 J	0.0141 T	0.00183 J	0.00306 J	0.00222 J	0.000643 JT	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)		0.00117 J	0.000632 J	0.00159 J	0.0391 J	0.15	0.688 T	0.0861	0.109	0.126	0.0408 T	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)		0.0124	0.00718 J	0.0165	0.338 J	1.3	6.13 T	1.34	1.64	1.36	0.463 T	
Total Tetrachlorodibenzo-p-dioxin (TCDD)		0.000302 U	0.00057	0.000592	0.000187 U	0.000365 U	0.0128 JT	0.00600 J	0.0128 J	0.00232	0.000150 UT	
Total Pentachlorodibenzo-p-dioxin (PeCDD)		0.000247 U	0.000281 J	0.000258 U	0.000364	0.00635 J	0.0356 JT	0.0145 J	0.0270 J	0.00147	0.000884 JT	
Total Hexachlorodibenzo-p-dioxin (HxCDD)		0.00108	0.000824	0.00143	0.00930 J	0.0583 J	0.27 T	0.0532 J	0.0888	0.0444 J	0.0126 T	
Total Heptachlorodibenzo-p-dioxin (HpCDD)		0.00316	0.00237 J	0.00457	0.104 J	0.371	1.41 T	0.245	0.291	0.313	0.0998 T	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6	0.000272 U	0.000106 U	0.000150 U	0.000238 U	0.00137	0.00651 T	0.000707 J	0.00147	0.000711 U	0.000376 JT	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		0.000225 U	0.000141 U	0.000206 U	0.000303 U	0.00108 J	0.00886 T	0.00143 J	0.00274 J	0.000810 U	0.000192 UT	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.000243 U	0.000131 U	0.000216 U	0.000283 U	0.000477 J	0.00540 T	0.00181 J	0.00587	0.00130 J	0.000375 JT
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.0000928 U	0.0000770 U	0.0000983 U	0.000383 J	0.00341 J	0.0191 T	0.00311 J	0.00672	0.00307 J	0.00102 JT
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.0000972 U	0.0000806 U	0.000100 U	0.0000928 U	0.000139 J	0.00936 T	0.0091	0.0194	0.00138 J	0.000364 JT
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			0.000177 U	0.000114 U	0.000179 U	0.000168 U	0.000361 J	0.00218 JT	0.000553 J	0.00114 J	0.000494 U	0.000269 JT
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.0000964 U	0.0000866 U	0.000114 U	0.000183 J	0.00112 J	0.00723 T	0.00436	0.00914	0.00126 J	0.000283 JT
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			0.000130 U	0.0000880 U	0.000132 U	0.00445 J	0.0238	0.0869 T	0.128	0.277	0.0129	0.00406 JT
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			0.000135 U	0.0000954 U	0.000137 U	0.000175 U	0.00194 J	0.00737 T	0.00187 J	0.00358 J	0.00204 J	0.000353 JT
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			0.000244 U	0.000178 U	0.000244 U	0.0174 J	0.0694	0.159 T	0.0667	0.124	0.0549	0.0101 JT
Total Tetrachlorodibenzofuran (TCDF)		0.000272 U	0.000106 U	0.000150 U	0.000238 U	0.00469 J	0.0510 JT	0.0316 J	0.0884 J	0.000711 U	0.00106 T	
Total Pentachlorodibenzofuran (PeCDF)		0.000234 U	0.000136 U	0.000211 U	0.000472	0.0133 J	0.102 JT	0.0844 J	0.191	0.00741	0.00262 JT	
Total Hexachlorodibenzofuran (HxCDF)		0.000114 U	0.0000887 U	0.000121 U	0.00577 J	0.0412 J	0.214 JT	0.129	0.312	0.0264 J	0.00857 JT	
Total Heptachlorodibenzofuran (HpCDF)		0.000133 U	0.0000915 U	0.000134 U	0.0172 J	0.0962	0.286 T	0.254	0.548	0.0449 J	0.0144 T	
PCB Aroclors (µg/kg)												
Aroclor 1016			5.94 U	5.62 U	5.80 U	7.60 U	7.64 U	6.95 UT	--	--	7.77 U	7.49 UT
Aroclor 1221			5.94 U	5.62 U	5.80 U	7.60 U	7.64 U	6.95 UT	--	--	7.77 U	7.49 UT
Aroclor 1232			5.94 U	5.62 U	5.80 U	7.60 U	7.64 U	6.95 UT	--	--	7.77 U	7.49 UT
Aroclor 1242			5.94 U	5.62 U	5.80 U	7.60 U	7.64 U	8.51 JT	--	--	7.77 U	4.30 JT
Aroclor 1248			5.94 U	5.62 U	5.80 U	7.60 U	7.64 U	6.95 UT	--	--	7.77 U	7.49 UT
Aroclor 1254			5.94 U	5.62 U	5.80 U	5.65 J	9.33 J	29.6 JT	--	--	5.16 J	8.49 JT
Aroclor 1260			5.94 U	5.62 U	5.80 U	6.05 J	5.60 J	21.9 JT	--	--	4.61 J	6.60 JT
PH-ROD Total PCB Aroclors (U=1/2 max limit)	75	200	5.94 UT	5.62 UT	5.80 UT	30.7 JT	34.0 JT	73.9 JT	--	--	29.2 JT	34.4 JT

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Wheeler Bay	Slip 1	Slip 1	Slip 1	Slip 1	Berth 401					
Location ID	T4-PDI2019-SC29	T4-PDI2019-SC30	T4-PDI2019-SC30	T4-PDI2019-SC30	T4-PDI2019-SC32	T4-PDI2019-SC43	T4-PDI2019-SC43	T4-PDI2019-SC47	T4-PDI2019-SC47	T4-PDI2019-SC67	
Abbreviated Location ID	SC29	SC30	SC30	SC30	SC32	SC43	SC43	SC47	SC47	SC67	
Sample ID	T4-PDI2019-SC29-190524-05-07	T4-PDI2019-SC30-190524-01-03	T4-PDI2019-SC30-190524-03-05	T4-PDI2019-SC30-190524-05-07	T4-PDI2019-SC32-190523-01-03	T4-PDI2019-SC43-190523-01-03	T4-PDI2019-SC43-190523-03-05	T4-PDI2019-SC47-190522-01-03	T4-PDI2019-SC47-190522-03-05	T4-PDI2019-SC67-190522-01-03	
Depth	5 - 7 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	1 - 3 ft	1 - 3 ft	3 - 5 ft	1 - 3 ft	3 - 5 ft	1 - 3 ft	
Sample Date	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/23/2019	5/23/2019	5/23/2019	5/22/2019	5/22/2019	5/22/2019	
RAL											
PTW											
Conventional Parameters (ppt)											
Total organic carbon		2	1.7 T	1.5	0.61	1.7	0.082	0.023	2.3	1.2	0.06
Total solids		56.7	54.0 T	59.1	66.7	47.8	79.3	84.2	54.9	66.2	82.8
Grain Size (ppt)											
Gravel (>2mm)		0.1	0.010 U	0.13	0.21	0.010 U	1.57	0.28	0.3	0.37	3.16
Sand (2.0mm – 0.063mm)		11.7	10.9	15.7	61.4	15.3	92	97.9	27.9	52.2	95
Silt, 5-63 micron		64.8	68.9	63	31.5	62	4.7	1.5	51	32.1	1.4
Clay, <5 micron		23.4	20.2	21.1	7	22.7	1.8	0.3	20.8	15.4	0.4
Percent retained 63 micron sieve (#230)		2.55	3.12	2.38	7.07	4.33	0.67	0.2	1.62	0.97	0.16
Percent retained 75 micron sieve (#200)		3.81	4.22	3.67	17	6.16	1.8	0.58	2.79	1.99	0.46
Percent retained 106 micron sieve (#140)		2.35	1.74	2.52	17.2	2.76	3.09	1.27	2.07	1.98	1.4
Percent retained 150 micron sieve (#100)		1.99	1.08	3.47	13.6	1.32	18.6	10.8	6.62	9.22	14.2
Percent retained 250 micron sieve (#60)		0.62	0.5	2.61	4.96	0.49	49.5	45.9	11.5	24.8	50.9
Percent retained 425 micron sieve (#40)		0.28	0.21	0.92	1.36	0.21	16.8	35.7	3.21	12.3	25.6
Percent retained 850 micron sieve (#20)		0.09	0.02	0.14	0.13	0.01	1.54	3.39	0.12	0.89	2.24
Percent retained 2000 micron sieve (#10)		0.07	0.010 U	0.13	0.14	0.010 U	0.49	0.07	0.11	0.15	0.81
Percent retained 4750 micron sieve (#4)		0.03	0.010 U	0.010 U	0.07	0.010 U	1.07	0.21	0.19	0.22	2.34
Polycyclic Aromatic Hydrocarbons (µg/kg)											
2-Methylnaphthalene		362 U	369 UT	353 U	76.6 U	--	--	--	--	--	--
Acenaphthene		182 U	300 T	92.1 J	52	--	--	--	--	--	--
Acenaphthylene		182 U	185 UT	177 U	38.4 U	--	--	--	--	--	--
Anthracene		182 U	270 JT	177 U	20.4 J	--	--	--	--	--	--
Benzo(a)anthracene		311 J	2000 T	475 J	86.2	--	--	--	--	--	--
Benzo(a)pyrene		372	2970 T	614	123	--	--	--	--	--	--
Benzo(b)fluoranthene		531 J	3620 JT	803 J	115 J	--	--	--	--	--	--
Benzo(g,h,i)perylene		282	1880 T	386	101	--	--	--	--	--	--
Benzo(k)fluoranthene		187 J	1440 T	321	48.2 J	--	--	--	--	--	--
Chrysene		400 J	2270 T	572 J	98.6	--	--	--	--	--	--
Dibenzo(a,h)anthracene		182 U	400 JT	99.2 J	38.4 U	--	--	--	--	--	--
Fluoranthene		600	3000 T	792	243	--	--	--	--	--	--
Fluorene		182 U	188 JT	177 U	26.4 J	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene		279	2030 T	452	88.6	--	--	--	--	--	--
Naphthalene	140000	362 U	369 UT	353 U	48.9 J	--	--	--	--	--	--
Phenanthrene		296	1380 T	404	313	--	--	--	--	--	--
Pyrene		563	2890 T	751	311	--	--	--	--	--	--
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		718 JT	5060 JT	1120 JT	163 JT	--	--	--	--	--	--
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	580 JT	4200 JT	890 JT	172 JT	--	--	--	--	--	--
PH-ROD Total PAH (U=1/2 max limit)	30000	4600 JT	25000 JT	6380 JT	1750 JT	--	--	--	--	--	--
Pesticides (µg/kg)											
2,4'-DDD (o,p'-DDD)		--	--	--	--	4.00 U	--	--	--	--	--
2,4'-DDE (o,p'-DDE)		--	--	--	--	4.00 U	--	--	--	--	--
2,4'-DDT (o,p'-DDT)		--	--	--	--	4.00 U	--	--	--	--	--
4,4'-DDD (p,p'-DDD)		--	--	--	--	4.00 U	--	--	--	--	--
4,4'-DDE (p,p'-DDE)		--	--	--	--	4.00 U	--	--	--	--	--
4,4'-DDT (p,p'-DDT)		--	--	--	--	4.00 U	--	--	--	--	--
Aldrin		--	--	--	--	4.00 U	--	--	--	--	--
Dieldrin		--	--	--	--	4.00 U	--	--	--	--	--
Hexachlorocyclohexane (BHC), gamma- (Lindane)		--	--	--	--	4.00 U	--	--	--	--	--
PH-ROD Total DDX (U=1/2 max limit)	160	7050	--	--	--	4.00 UT	--	--	--	--	--
Dioxin Furans (µg/kg)											
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.0006	0.01	0.000544 U	0.000415 JT	0.000729 J	0.000324 J	0.000120 U	--	--	0.00121	0.00104
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.0008	0.01	0.000547 U	0.000797 JT	0.00215 J	0.000326 J	0.000234 J	--	--	0.00417	0.00308
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000923 UJ	0.00105 JT	0.00294 J	0.000286 U	0.000278 U	--	--	0.0068	0.00564

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

SubArea	Wheeler Bay	Slip 1	Slip 1	Slip 1	Slip 1	Berth 401				
	T4-PDI2019-SC29	T4-PDI2019-SC30	T4-PDI2019-SC30	T4-PDI2019-SC30	T4-PDI2019-SC32	T4-PDI2019-SC43	T4-PDI2019-SC43	T4-PDI2019-SC47	T4-PDI2019-SC47	T4-PDI2019-SC67
Location ID	SC29	SC30	SC30	SC30	SC32	SC43	SC43	SC47	SC47	SC67
Abbreviated Location ID	T4-PDI2019-SC29-190524-05-07	T4-PDI2019-SC30-190524-01-03	T4-PDI2019-SC30-190524-03-05	T4-PDI2019-SC30-190524-05-07	T4-PDI2019-SC32-190523-01-03	T4-PDI2019-SC43-190523-01-03	T4-PDI2019-SC43-190523-03-05	T4-PDI2019-SC47-190522-01-03	T4-PDI2019-SC47-190522-03-05	T4-PDI2019-SC67-190522-01-03
Sample ID	190524-05-07	190524-01-03	190524-03-05	190524-05-07	190523-01-03	190523-01-03	190523-03-05	190522-01-03	190522-03-05	190522-01-03
Depth	5 - 7 ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	1 - 3 ft	1 - 3 ft	3 - 5 ft	1 - 3 ft	3 - 5 ft	1 - 3 ft
Sample Date	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/23/2019	5/23/2019	5/23/2019	5/22/2019	5/22/2019	5/22/2019
RAL										
PTW										
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			0.00165 J	0.00678 T	0.0205 J	0.00195 J	0.00164 J	--	0.0575	0.0488
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			0.000978 U	0.00283 JT	0.00809	0.000962 J	0.000906 J	--	0.0183	0.0146
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)			0.0368 J	0.165 T	0.409 J	0.0533	0.0358	--	1.04 J	0.845
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)			0.362 J	1.57 T	5.23 J	0.667	0.311	--	11.5 J	6.56
Total Tetrachlorodibenzo-p-dioxin (TCDD)			0.000544 U	0.00179 JT	0.00863 J	0.000324 J	0.000835	--	0.0135 J	0.0185 J
Total Pentachlorodibenzo-p-dioxin (PeCDD)			0.000547 U	0.00656 JT	0.0227 J	0.00186 J	0.000998 J	--	0.0310 J	0.0278
Total Hexachlorodibenzo-p-dioxin (HxCDD)			0.0155 J	0.0527 JT	0.159 J	0.0186	0.0108 J	--	0.32	0.261
Total Heptachlorodibenzo-p-dioxin (HpCDD)			0.0787 J	0.431 T	0.942 J	0.129	0.0766	--	2.18	1.7
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.6		0.000372 U	0.00123 T	0.00188	0.000389 J	0.000174 U	--	0.0072	0.00504
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)			0.000449 J	0.00165 JT	0.00287 J	0.00101 J	0.000240 J	--	0.00864	0.00771
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.2	0.2	0.000526 U	0.00140 JT	0.00164 J	0.000304 J	0.000203 U	--	0.00919	0.00647
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)		0.04	0.000892 J	0.00587 JT	0.0108	0.00244 J	0.000615 J	--	0.0483 J	0.0347
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.000299 U	0.00185 JT	0.00641	0.00119 J	0.000456 J	--	0.0137	0.0122
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			0.000531 U	0.000761 JT	0.00145 J	0.000297 J	0.000141 U	--	0.00518	0.00411
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			0.000316 U	0.00160 JT	0.00533	0.000756 J	0.000438 J	--	0.0133	0.0109
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			0.00300 J	0.0250 T	0.0696 J	0.0149	0.00609	--	0.176	0.148
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			0.000437 U	0.00240 JT	0.00588	0.00115 J	0.000208 U	--	0.018	0.0155
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)			0.0104 J	0.0690 T	0.19 J	0.0475	0.017	--	0.515	0.393
Total Tetrachlorodibenzofuran (TCDF)			0.000372 U	0.00410 T	0.0214 J	0.00234 J	0.000174 U	--	0.0478 J	0.0487 J
Total Pentachlorodibenzofuran (PeCDF)			0.00170 J	0.0193 JT	0.0595 J	0.00793 J	0.00347 J	--	0.153 J	0.147 J
Total Hexachlorodibenzofuran (HxCDF)			0.00698 J	0.0459 JT	0.135	0.0244	0.00889 J	--	0.386 J	0.334
Total Heptachlorodibenzofuran (HpCDF)			0.00984 J	0.0903 T	0.237 J	0.0563 J	0.0196	--	0.681	0.634 J
PCB Aroclors ($\mu\text{g}/\text{kg}$)										
Aroclor 1016			7.04 U	7.18 UT	6.70 U	5.97 U	8.34 U	4.95 U	4.74 U	--
Aroclor 1221			7.04 U	7.18 UT	6.70 U	5.97 U	8.34 U	4.95 U	4.74 U	--
Aroclor 1232			7.04 U	9.87 UT	6.70 U	5.97 U	8.34 U	4.95 U	4.74 U	--
Aroclor 1242			7.90 J	7.18 UT	5.07 J	5.97 U	8.34 U	4.95 U	4.74 U	--
Aroclor 1248			7.04 U	7.18 UT	6.70 U	5.97 U	8.34 U	4.95 U	4.74 U	--
Aroclor 1254			24.7 J	7.50 JT	21.0 J	7.05 J	6.73 J	8.99 J	4.74 U	--
Aroclor 1260			21.0 J	6.20 JT	13.3 J	5.73 J	8.34 U	11.0 J	4.74 U	--
PH-ROD Total PCB Aroclors (U=1/2 max limit)	75	200	67.7 JT	33.0 JT	52.8 JT	27.7 JT	31.8 JT	32.4 JT	4.74 UT	--
										4.65 UT

Table 5-1a
Subsurface Sediment Data: Open-Water Stations

Notes:

- Detected concentration is greater than the RAL
- Detected concentration is greater than the PTW threshold
- Non-detected concentration is above one or more identified screening levels

Bold: Detected result

J: Estimated value

JT: Estimated value (calculated result)

T: Calculated or averaged result

U: Compound analyzed but not detected above detection limit

UU: Compound analyzed but not detected above estimated detection limit

UT: Compound analyzed for but not detected above detection limit (calculated result)

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

DDD: dichlorodiphenyldichloroethane

DDE: dichlorodiphenyldichloroethylene

DDT: dichlorodiphenyltrichloroethane

DDx: sum of DDD, DDE, and DDT

ft: feet

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

T4: Terminal 4

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-1b
Subsurface Sediment Data: Underpier Slip 3 Stations

SubArea Location ID Abbreviated Location ID Sample ID Depth Sample Date RAL PTW	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	Slip 3	
	T4-PDI2019-SC24	T4-PDI2019-SC24	T4-PDI2019-SC25	T4-PDI2019-SC25	T4-PDI2019-SC26	T4-PDI2019-SC26	
	SC24	SC24	SC25	SC25	SC26	SC26	
	T4-PDI2019-SC24- 190529-01-02	T4-PDI2019-SC24- 190529-02-2.2	T4-PDI2019-SC25- 190529-01-02	T4-PDI2019-SC25- 190529-02-2.21	T4-PDI2019-SC26- 190530-01-02	T4-PDI2019-SC26- 190530-02-2.27	
	1 - 2 ft	2 - 2.2 ft	1 - 2 ft	2 - 2.21 ft	1 - 2 ft	2 - 2.27 ft	
	5/29/2019	5/29/2019	5/29/2019	5/29/2019	5/30/2019	5/30/2019	
Conventional Parameters (ppt)							
Total organic carbon		0.54	2.6	1.5	1.6	5.9	1.9
Total solids		72.9	77.7	68.8	69.4	65.3	56.1
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene		34800 U	64400 U	7620 U	74400 U	81500 U	808 J
Acenaphthene		21500	47200	21300	59500	153000	4490
Acenaphthylene		17400 U	32200 U	3820 U	37300 U	40800 U	471 U
Anthracene		15500 J	32900	9770	42000	123000	3540
Benzo(a)anthracene		88600	180000	114000	264000	690000	21000
Benzo(a)pyrene		118000	240000	123000	365000	922000	29300
Benzo(b)fluoranthene		143000	289000	154000	455000	1180000	37800
Benzo(g,h,i)perylene		95300	189000	88700	273000	634000	21100
Benzo(k)fluoranthene		59500 J	122000 J	58500 J	165000 J	465000 J	12000 J
Chrysene		102000	209000	120000	313000	808000	24300
Dibenzo(a,h)anthracene		20500	41700	22900	65900	154000	5060
Fluoranthene		140000	285000	226000	382000	1200000	35400
Fluorene		17400 U	32200 U	20700	18700 J	127000	2860
Indeno(1,2,3-c,d)pyrene		104000	213000	97300	302000	703000	21900
Naphthalene	140000	34800 U	64400 U	7620 U	74400 U	81500 U	1070
Phenanthrene		70900	146000	87900	199000	818000	19200
Pyrene		138000	276000	184000	366000	1030000	31300
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)		203000 JT	411000 JT	213000 JT	620000 JT	1650000 JT	50000 JT
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	774000	173000 JT	350000 JT	180000 JT	535000 JT	1300000 JT	43000 JT
PH-ROD Total PAH (U=1/2 max limit)	30000	1200000 JT	2400000 JT	1300000 JT	3400000 JT	9100000 JT	270000 JT
PCB Aroclors (µg/kg)							
Aroclor 1016		--	--	--	--	5.84 UJ	6.85 U
Aroclor 1221		--	--	--	--	5.84 UJ	6.85 U
Aroclor 1232		--	--	--	--	5.84 UJ	6.85 U
Aroclor 1242		--	--	--	--	8.12 J	6.85 U
Aroclor 1248		--	--	--	--	5.84 UJ	6.85 U
Aroclor 1254		--	--	--	--	5.84 UJ	6.85 U
Aroclor 1260		--	--	--	--	11.6 J	319 J
PH-ROD Total PCB Aroclors (U=1/2 max limit)	75	200	--	--	--	34.3 JT	340 JT

Table 5-1b
Subsurface Sediment Data: Underpier Slip 3 Stations

Notes:

 Detected concentration is greater than the RAL

 Detected concentration is greater than the PTW threshold

 Non-detected concentration is above one or more identified screening levels

Bold: Detected result

J: Estimated value

JT: Estimated value (calculated result)

T: Calculated or averaged result

U: Compound analyzed but not detected above detection limit

UU: Compound analyzed but not detected above estimated detection limit

UT: Compound analyzed for but not detected above detection limit (calculated result)

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

ft: feet

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

T4: Terminal 4

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-2a
Subsurface Sediment Data Summary Statistics: Berth 414

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (ppt)														
Total organic carbon	2	2	2	0	1.7	2	--	0	0	--	--	--	--	0
Total solids	2	2	2	0	60.7	68.9	--	0	0	--	--	--	--	0
Grain Size (ppt)														
Gravel (>2mm)	2	2	2	0	2.42	3.11	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	2	2	2	0	37.4	58.3	--	0	0	--	--	--	--	0
Silt, 5-63 micron	2	2	2	0	29.9	42.4	--	0	0	--	--	--	--	0
Clay, <5 micron	2	2	2	0	8.7	17.9	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	2	2	2	0	394	1510	--	0	0	--	--	--	--	0
Acenaphthene	2	2	1	1	460	460	--	0	0	--	--	--	--	0
Acenaphthylene	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Anthracene	2	2	2	0	170	1590	--	0	0	--	--	--	--	0
Benzo(a)anthracene	2	2	2	0	504	1980	--	0	0	--	--	--	--	0
Benzo(a)pyrene	2	2	2	0	789	2050	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	2	2	2	0	681	1750	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	2	2	2	0	512	1480	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	2	2	2	0	257	573	--	0	0	--	--	--	--	0
Chrysene	2	2	2	0	552	3200	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	2	2	1	1	209	209	--	0	0	--	--	--	--	0
Fluoranthene	2	2	2	0	1170	4250	--	0	0	--	--	--	--	0
Fluorene	2	2	2	0	306	1570	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	2	2	2	0	436	1080	--	0	0	--	--	--	--	0
Naphthalene	2	2	2	0	863	1370	--	0	0	--	--	--	140000	0
Phenanthrene	2	2	2	0	1100	7950	--	0	0	--	--	--	--	0
Pyrene	2	2	2	0	1350	6730	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	2	2	2	0	938	2320	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	2	2	2	0	1040	2700	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	2	2	2	0	9700	38000	30000	1	0	--	--	1.3	--	0
Pesticides (µg/kg)														
2,4'-DDD (o,p'-DDD)	2	2	1	1	2.81	2.81	--	0	0	--	--	--	--	0
2,4'-DDE (o,p'-DDE)	2	2	0	2	--	--	--	0	0	--	--	--	--	0
2,4'-DDT (o,p'-DDT)	2	2	0	2	--	--	--	0	0	--	--	--	--	0
4,4'-DDD (p,p'-DDD)	2	2	2	0	10.8	24.2	--	0	0	--	--	--	--	0
4,4'-DDE (p,p'-DDE)	2	2	2	0	5.86	9.69	--	0	0	--	--	--	--	0
4,4'-DDT (p,p'-DDT)	2	2	2	0	19.8	66	--	0	0	--	--	--	--	0
Aldrin	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Dieldrin	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Hexachlorocyclohexane (BHC), gamma- (Lindane)	2	2	0	2	--	--	--	0	0	--	--	--	--	0
PH-ROD Total DDx (U=1/2 max limit)	2	2	2	0	42.3	109	160	0	0	--	--	--	7050	0

Table 5-2a
Subsurface Sediment Data Summary Statistics: Berth 414

Notes:

µg/kg; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

DDD: dichlorodiphenylchloroethane

DDE: dichlorodiphenylchloroethylene

DDT: dichlorodiphenyltrichloroethane

DDx: sum of DDD, DDE, and DDT

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-2b
Subsurface Sediment Data Summary Statistics: Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (ppt)														
Total organic carbon	21	21	21	0	0.028	2	--	0	0	--	--	--	--	0
Total solids	21	21	21	0	57.2	83.6	--	0	0	--	--	--	--	0
Grain Size (ppt)														
Gravel (>2mm)	21	21	9	12	0.01	36.5	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	21	21	21	0	12.9	95.8	--	0	0	--	--	--	--	0
Silt, 5-63 micron	21	21	21	0	2.1	71.7	--	0	0	--	--	--	--	0
Clay, <5 micron	21	21	21	0	1.2	18.6	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	21	21	4	17	4.06	336	--	0	0	--	--	--	--	0
Acenaphthene	21	21	7	14	3.38	4390	--	0	0	--	--	--	--	0
Acenaphthylene	21	21	3	18	89.9	223	--	0	0	--	--	--	--	0
Anthracene	21	21	7	14	4.19	3750	--	0	0	--	--	--	--	0
Benzo(a)anthracene	21	21	8	13	3.99	29200	--	0	0	--	--	--	--	0
Benzo(a)pyrene	21	21	8	13	4.61	35400	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	21	21	8	13	4.59	41700	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	21	21	8	13	2.67	23000	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	21	21	7	14	5.27	13700	--	0	0	--	--	--	--	0
Chrysene	21	21	8	13	2.58	30200	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	21	21	6	15	109	5440	--	0	0	--	--	--	--	0
Fluoranthene	21	21	8	13	5.66	38000	--	0	0	--	--	--	--	0
Fluorene	21	21	7	14	2.82	1610	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	21	21	8	13	2.7	23500	--	0	0	--	--	--	--	0
Naphthalene	21	21	7	14	10.1	646	--	0	0	--	--	--	140000	0
Phenanthrene	21	21	8	13	4.27	15700	--	0	0	--	--	--	--	0
Pyrene	21	21	8	13	6.04	36500	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	21	21	8	13	7.31	55400	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	21	21	8	13	7.58	50400	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	21	21	9	12	39.7	300000	30000	5	0	2.3	--	10	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	15	15	3	12	0.000394	0.000858	0.0006	2	0	1.1	--	1.4	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	15	15	5	10	0.00024	0.00213	0.0008	4	0	1.5	--	2.7	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	15	15	5	10	0.000507	0.00745	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	15	15	5	10	0.00231	0.0373	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	15	15	5	10	0.000797	0.0155	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	15	15	14	1	0.000576	2.31	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	15	15	15	0	0.00232	15.8	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	15	15	10	5	0.000327	0.00541	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	15	15	6	9	0.000281	0.0222	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	15	15	14	1	0.000371	0.418	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	15	15	15	0	0.000345	4.29	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	15	15	5	10	0.000693	0.00283	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	15	15	5	10	0.000919	0.00434	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	15	15	5	10	0.000428	0.00298	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	15	15	6	9	0.000261	0.0106	--	0	0	--	--	--	0.04	0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	15	15	5	10	0.000924	0.00417	--	0	0	--	--	--	--	0

Table 5-2b
Subsurface Sediment Data Summary Statistics: Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	15	15	5	10	0.000366	0.00116	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	15	15	5	10	0.00053	0.00398	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	15	15	6	9	0.000889	0.0987	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	15	15	5	10	0.00109	0.00795	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	15	15	6	9	0.0015	0.444	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	15	15	5	10	0.00191	0.0185	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	15	15	5	10	0.00706	0.0424	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	15	15	6	9	0.0011	0.123	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	15	15	6	9	0.00141	0.406	--	0	0	--	--	--	--	0
PCB Aroclors ($\mu\text{g}/\text{kg}$)														
Aroclor 1016	21	21	0	21	--	--	--	0	0	--	--	--	--	0
Aroclor 1221	21	21	0	21	--	--	--	0	0	--	--	--	--	0
Aroclor 1232	21	21	0	21	--	--	--	0	0	--	--	--	--	0
Aroclor 1242	21	21	4	17	3.17	12.9	--	0	0	--	--	--	--	0
Aroclor 1248	21	21	0	21	--	--	--	0	0	--	--	--	--	0
Aroclor 1254	21	21	7	14	3.15	27.5	--	0	0	--	--	--	--	0
Aroclor 1260	21	21	5	16	6.76	36.2	--	0	0	--	--	--	--	0
PH-ROD Total PCB Aroclors (U=1/2 max limit)	21	21	7	14	19.7	87.8	75	1	0	--	--	1.2	200	0

Notes:

$\mu\text{g}/\text{kg}$; micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-2c
Subsurface Sediment Data Summary Statistics: Underpier Slip 3

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	6	6	6	0	0.54	5.9	--	0	0	--	--	--	--	0
Total solids	6	6	6	0	56.1	77.7	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	6	6	1	5	808	808	--	0	0	--	--	--	--	0
Acenaphthene	6	6	6	0	4490	153000	--	0	0	--	--	--	--	0
Acenaphthylene	6	6	0	6	--	--	--	0	0	--	--	--	--	0
Anthracene	6	6	6	0	3540	123000	--	0	0	--	--	--	--	0
Benzo(a)anthracene	6	6	6	0	21000	690000	--	0	0	--	--	--	--	0
Benzo(a)pyrene	6	6	6	0	29300	922000	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	6	6	6	0	37800	1180000	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	6	6	6	0	21100	634000	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	6	6	6	0	12000	465000	--	0	0	--	--	--	--	0
Chrysene	6	6	6	0	24300	808000	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	6	6	6	0	5060	154000	--	0	0	--	--	--	--	0
Fluoranthene	6	6	6	0	35400	1200000	--	0	0	--	--	--	--	0
Fluorene	6	6	4	2	2860	127000	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	6	6	6	0	21900	703000	--	0	0	--	--	--	--	0
Naphthalene	6	6	1	5	1070	1070	--	0	0	--	--	--	140000	0
Phenanthrene	6	6	6	0	19200	818000	--	0	0	--	--	--	--	0
Pyrene	6	6	6	0	31300	1030000	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	6	6	6	0	50000	1650000	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	6	6	6	0	43000	1300000	--	0	0	--	--	--	774000	1
PH-ROD Total PAH (U=1/2 max limit)	6	6	6	0	270000	9100000	30000	6	0	98	98	300	--	0
PCB Aroclors (µg/kg)														
Aroclor 1016	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1221	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1232	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1242	2	2	1	1	8.12	8.12	--	0	0	--	--	--	--	0
Aroclor 1248	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1254	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1260	2	2	2	0	11.6	319	--	0	0	--	--	--	--	0
PH-ROD Total PCB Aroclors (U=1/2 max limit)	2	2	2	0	34.3	340	75	1	0	2.5	2.5	4.5	200	1

Notes:

µg/kg: micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-2d
Subsurface Sediment Data Summary Statistics: Wheeler Bay

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect and non-detects/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (ppt)														
Total organic carbon	10	10	10	0	0.61	2.4	--	0	0	--	--	--	--	0
Total solids	10	10	10	0	47.8	66.7	--	0	0	--	--	--	--	0
Grain Size (ppt)														
Gravel (>2mm)	10	10	5	5	0.01	0.21	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	10	10	10	0	8.47	61.4	--	0	0	--	--	--	--	0
Silt, 5-63 micron	10	10	10	0	31.5	70.7	--	0	0	--	--	--	--	0
Clay, <5 micron	10	10	10	0	7	23.8	--	0	0	--	--	--	--	0
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	9	9	0	9	--	--	--	0	0	--	--	--	--	0
Acenaphthene	9	9	6	3	52	300	--	0	0	--	--	--	--	0
Acenaphthylene	9	9	0	9	--	--	--	0	0	--	--	--	--	0
Anthracene	9	9	5	4	20.4	299	--	0	0	--	--	--	--	0
Benzo(a)anthracene	9	9	9	0	86.2	2000	--	0	0	--	--	--	--	0
Benzo(a)pyrene	9	9	9	0	123	2970	--	0	0	--	--	--	--	0
Benzo(b)fluoranthene	9	9	9	0	115	3620	--	0	0	--	--	--	--	0
Benzo(g,h,i)perylene	9	9	9	0	101	1880	--	0	0	--	--	--	--	0
Benzo(k)fluoranthene	9	9	9	0	48.2	1440	--	0	0	--	--	--	--	0
Chrysene	9	9	9	0	98.6	2270	--	0	0	--	--	--	--	0
Dibenzo(a,h)anthracene	9	9	6	3	77.3	400	--	0	0	--	--	--	--	0
Fluoranthene	9	9	9	0	243	3000	--	0	0	--	--	--	--	0
Fluorene	9	9	4	5	26.4	188	--	0	0	--	--	--	--	0
Indeno(1,2,3-c,d)pyrene	9	9	9	0	88.6	2030	--	0	0	--	--	--	--	0
Naphthalene	9	9	1	8	48.9	48.9	--	0	0	--	--	--	140000	0
Phenanthrene	9	9	9	0	273	1380	--	0	0	--	--	--	--	0
Pyrene	9	9	9	0	311	3000	--	0	0	--	--	--	--	0
PH-ROD Total Benzo(x)fluoranthenes (U=1/2 max limit)	9	9	9	0	163	5060	--	0	0	--	--	--	--	0
PH-ROD Total cPAH/BaPEq TEQ (USEPA 1993) (U=1/2 max limit)	9	9	9	0	172	4200	--	0	0	--	--	--	774000	0
PH-ROD Total PAH (U=1/2 max limit)	9	9	9	0	1750	25000	30000	0	0	--	--	--	--	0
Pesticides (µg/kg)														
2,4'-DDD (o,p'-DDD)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
2,4'-DDE (o,p'-DDE)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
2,4'-DDT (o,p'-DDT)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
4,4'-DDD (p,p'-DDD)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
4,4'-DDE (p,p'-DDE)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
4,4'-DDT (p,p'-DDT)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aldrin	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Dieldrin	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Hexachlorocyclohexane (BHC), gamma- (Lindane)	1	1	0	1	--	--	--	0	0	--	--	--	--	0
PH-ROD Total DDx (U=1/2 max limit)	1	1	0	1	--	--	160	0	0	--	--	--	7050	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	12	12	5	7	0.000301	0.00108	0.0006	2	2	--	--	1.8	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	12	12	8	4	0.000234	0.00215	0.0008	5	1	1.4	1.1	2.7	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	12	12	7	5	0.000354	0.00659	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	12	12	12	0	0.000981	0.0451	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	12	12	10	2	0.000643	0.0141	--	0	0	--	--	--	--	0

Table 5-2d
Subsurface Sediment Data Summary Statistics: Wheeler Bay

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	12	12	12	0	0.0358	0.688	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	12	12	12	0	0.311	6.13	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	12	12	8	4	0.000324	0.0128	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	12	12	11	1	0.000364	0.0356	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	12	12	12	0	0.0093	0.27	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	12	12	12	0	0.0766	1.41	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	12	12	8	4	0.000376	0.00651	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	12	12	9	3	0.00024	0.00886	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	12	12	9	3	0.000304	0.00587	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	12	12	12	0	0.000383	0.0191	--	0	0	--	--	--	0.04	0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	12	12	10	2	0.000364	0.0194	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	12	12	8	4	0.000269	0.00218	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	12	12	11	1	0.000183	0.00914	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	12	12	12	0	0.003	0.277	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	12	12	9	3	0.000353	0.00737	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	12	12	12	0	0.0101	0.19	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	12	12	8	4	0.00106	0.0884	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	12	12	12	0	0.000472	0.191	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	12	12	12	0	0.00577	0.312	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	12	12	12	0	0.00984	0.548	--	0	0	--	--	--	--	0
PCB Aroclors ($\mu\text{g/kg}$)														
Aroclor 1016	10	10	0	10	--	--	--	0	0	--	--	--	--	0
Aroclor 1221	10	10	0	10	--	--	--	0	0	--	--	--	--	0
Aroclor 1232	10	10	0	10	--	--	--	0	0	--	--	--	--	0
Aroclor 1242	10	10	4	6	4.3	8.51	--	0	0	--	--	--	--	0
Aroclor 1248	10	10	0	10	--	--	--	0	0	--	--	--	--	0
Aroclor 1254	10	10	10	0	5.16	29.6	--	0	0	--	--	--	--	0
Aroclor 1260	10	10	9	1	4.61	21.9	--	0	0	--	--	--	--	0
PH-ROD Total PCB Aroclors (U=1/2 max limit)	10	10	10	0	27.7	73.9	75	0	0	--	--	--	200	0

Notes:

$\mu\text{g/kg}$: micrograms per kilogram

BaPEq: benzo(a)pyrene equivalence

cPAH: carcinogenic polycyclic aromatic hydrocarbon

DDD: dichlorodiphenyldichloroethane

DDE: dichlorodiphenyldichloroethylene

DDT: dichlorodiphenyltrichloroethane

DDx: sum of DDD, DDE, and DDT

Max: maximum

Min: minimum

mm: millimeter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

TEQ: toxic equivalents quotient

USEPA: U.S. Environmental Protection Agency

Table 5-2e
Subsurface Sediment Data Summary Statistics: Slip 1

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect and non-detects/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (ppt)														
Total organic carbon	4	4	4	0	0.023	2.3	--	0	0	--	--	--	--	0
Total solids	4	4	4	0	54.9	84.2	--	0	0	--	--	--	--	0
Grain Size (ppt)														
Gravel (>2mm)	4	4	4	0	0.28	1.57	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	4	4	4	0	27.9	97.9	--	0	0	--	--	--	--	0
Silt, 5-63 micron	4	4	4	0	1.5	51	--	0	0	--	--	--	--	0
Clay, <5 micron	4	4	4	0	0.3	20.8	--	0	0	--	--	--	--	0
Dioxin Furans (µg/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	2	2	2	0	0.00104	0.00121	0.0006	2	0	1.9	1.9	2	0.01	0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	2	2	2	0	0.00308	0.00417	0.0008	2	0	4.5	4.5	5.2	0.01	0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	2	2	2	0	0.00564	0.0068	--	0	0	--	--	--	--	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	2	2	2	0	0.0488	0.0575	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	2	2	2	0	0.0146	0.0183	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	2	2	2	0	0.845	1.04	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	2	2	2	0	6.56	11.5	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzo-p-dioxin (TCDD)	2	2	2	0	0.0135	0.0185	--	0	0	--	--	--	--	0
Total Pentachlorodibenzo-p-dioxin (PeCDD)	2	2	2	0	0.0278	0.031	--	0	0	--	--	--	--	0
Total Hexachlorodibenzo-p-dioxin (HxCDD)	2	2	2	0	0.261	0.32	--	0	0	--	--	--	--	0
Total Heptachlorodibenzo-p-dioxin (HpCDD)	2	2	2	0	1.7	2.18	--	0	0	--	--	--	--	0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	2	2	2	0	0.00504	0.0072	--	0	0	--	--	--	0.6	0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	2	2	2	0	0.00771	0.00864	--	0	0	--	--	--	--	0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	2	2	2	0	0.00647	0.00919	0.2	0	0	--	--	--	0.2	0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	2	2	2	0	0.0347	0.0483	--	0	0	--	--	--	0.04	1
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	2	2	2	0	0.0122	0.0137	--	0	0	--	--	--	--	0
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	2	2	2	0	0.00411	0.00518	--	0	0	--	--	--	--	0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	2	2	2	0	0.0109	0.0133	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	2	2	2	0	0.148	0.176	--	0	0	--	--	--	--	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	2	2	2	0	0.0155	0.018	--	0	0	--	--	--	--	0
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	2	2	2	0	0.393	0.515	--	0	0	--	--	--	--	0
Total Tetrachlorodibenzofuran (TCDF)	2	2	2	0	0.0478	0.0487	--	0	0	--	--	--	--	0
Total Pentachlorodibenzofuran (PeCDF)	2	2	2	0	0.147	0.153	--	0	0	--	--	--	--	0
Total Hexachlorodibenzofuran (HxCDF)	2	2	2	0	0.334	0.386	--	0	0	--	--	--	--	0
Total Heptachlorodibenzofuran (HpCDF)	2	2	2	0	0.634	0.681	--	0	0	--	--	--	--	0
PCB Aroclors (µg/kg)														
Aroclor 1016	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1221	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1232	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1242	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1248	2	2	0	2	--	--	--	0	0	--	--	--	--	0
Aroclor 1254	2	2	1	1	8.99	8.99	--	0	0	--	--	--	--	0
Aroclor 1260	2	2	1	1	11	11	--	0	0	--	--	--	--	0
PH-ROD Total PCB Aroclors (U=1/2 max limit)	2	2	1	1	32.4	32.4	75	0	0	--	--	--	200	0

Table 5-2e
Subsurface Sediment Data Summary Statistics: Slip 1

Notes:
µg/kg; micrograms per kilogram

Max: maximum

Min: minimum

mm: millimeter

PCB: polychlorinated biphenyl

pct: percent

PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

Table 5-2f
Subsurface Sediment Data Summary Statistics: Berth 401

	No. of Results	No. of Samples	No. of Detections	No. of Non-Detects	Min Detected Result	Max Detected Result	Remedial Action Level	No. of RAL Exceedances for Detects	No. of RAL Exceedances for Non-Detects	Average RAL Exceedance Factor (average detect/RAL)	Average RAL Exceedance Factor (average detect and non-detects/RAL)	Maximum RAL Exceedance Factor (max detect and non-detects/RAL)	PTW Threshold	No. of PTW Exceedances for Detected Values
Conventional Parameters (pct)														
Total organic carbon	1	1	1	0	0.06	0.06	--	0	0	--	--	--	--	0
Total solids	1	1	1	0	82.8	82.8	--	0	0	--	--	--	--	0
Grain Size (pct)														
Gravel (>2mm)	1	1	1	0	3.16	3.16	--	0	0	--	--	--	--	0
Sand (2.0mm – 0.063mm)	1	1	1	0	95	95	--	0	0	--	--	--	--	0
Silt, 5-63 micron	1	1	1	0	1.4	1.4	--	0	0	--	--	--	--	0
Clay, <5 micron	1	1	1	0	0.4	0.4	--	0	0	--	--	--	--	0
PCB Aroclors (µg/kg)														
Aroclor 1016	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aroclor 1221	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aroclor 1232	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aroclor 1242	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aroclor 1248	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aroclor 1254	1	1	0	1	--	--	--	0	0	--	--	--	--	0
Aroclor 1260	1	1	0	1	--	--	--	0	0	--	--	--	--	0
PH-ROD Total PCB Aroclors (U=1/2 max limit)	1	1	0	1	--	--	75	0	0	--	--	--	200	0

Notes:

µg/kg; micrograms per kilogram

Max: maximum

Min: minimum

mm: millimeter

PCB: polychlorinated biphenyl

pct: percent

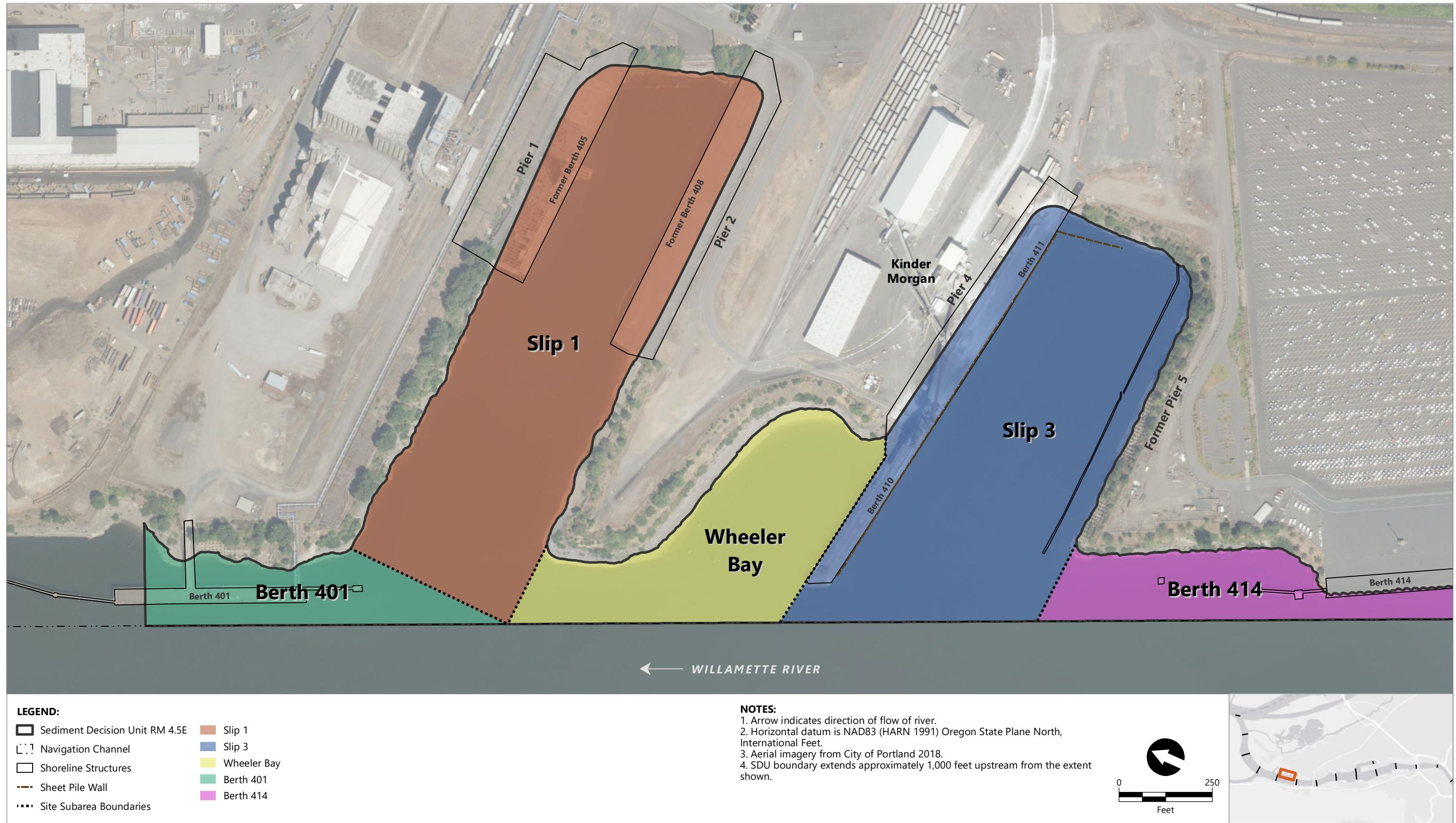
PH: Portland Harbor

PTW: principal threat waste

RAL: remedial action level

ROD: Record of Decision

Figures

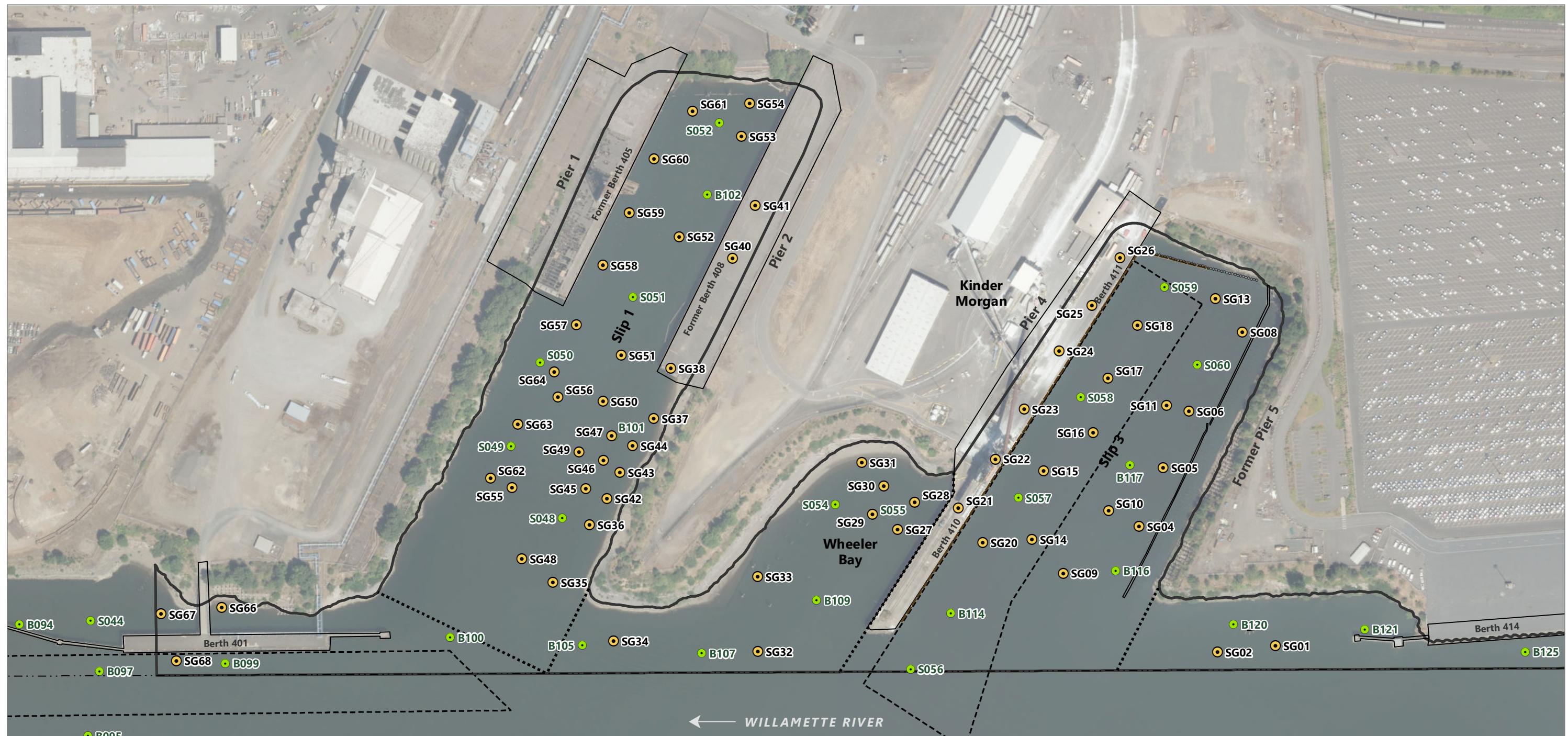


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Figure 1-1

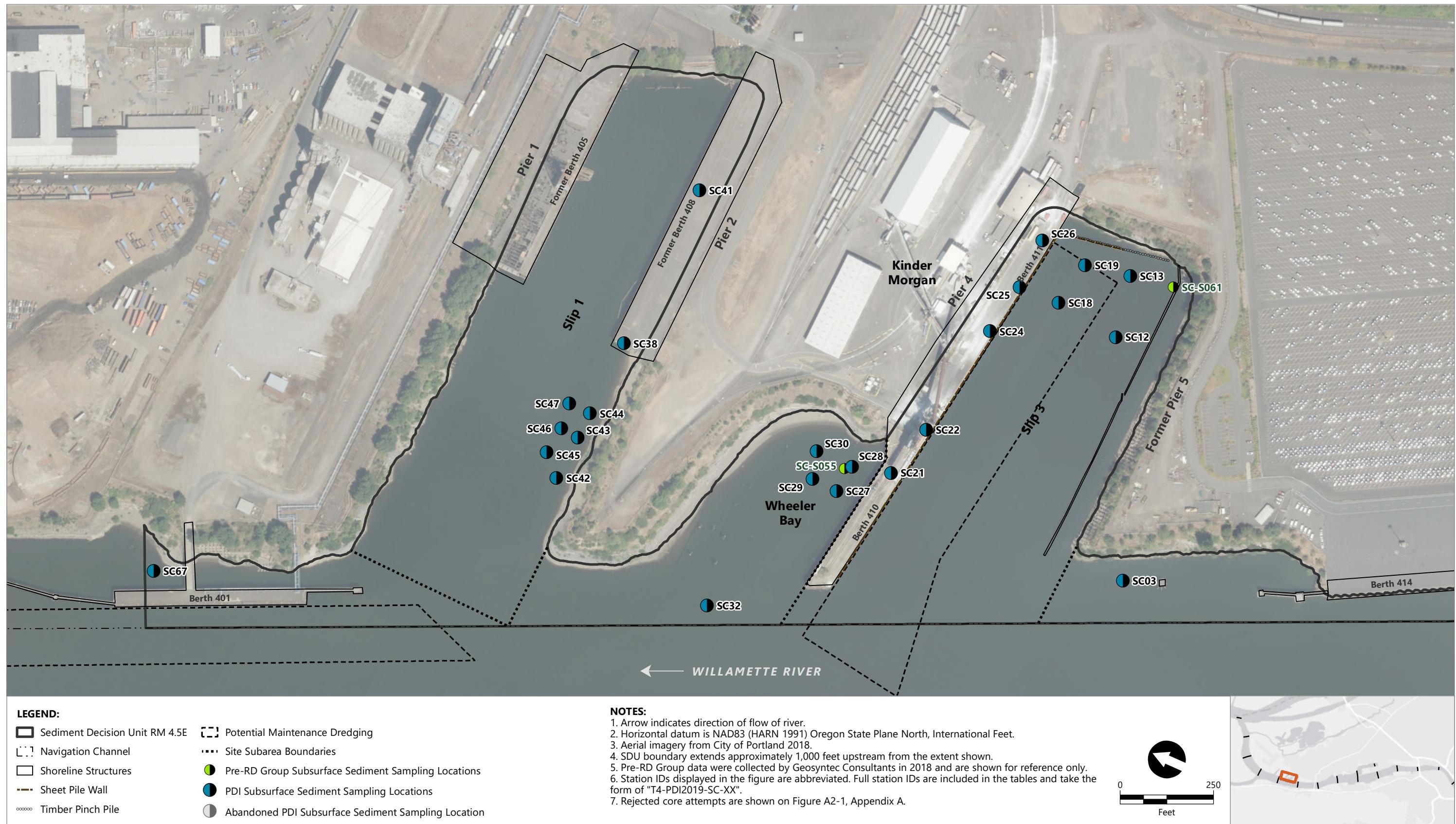
Site Location and Subareas



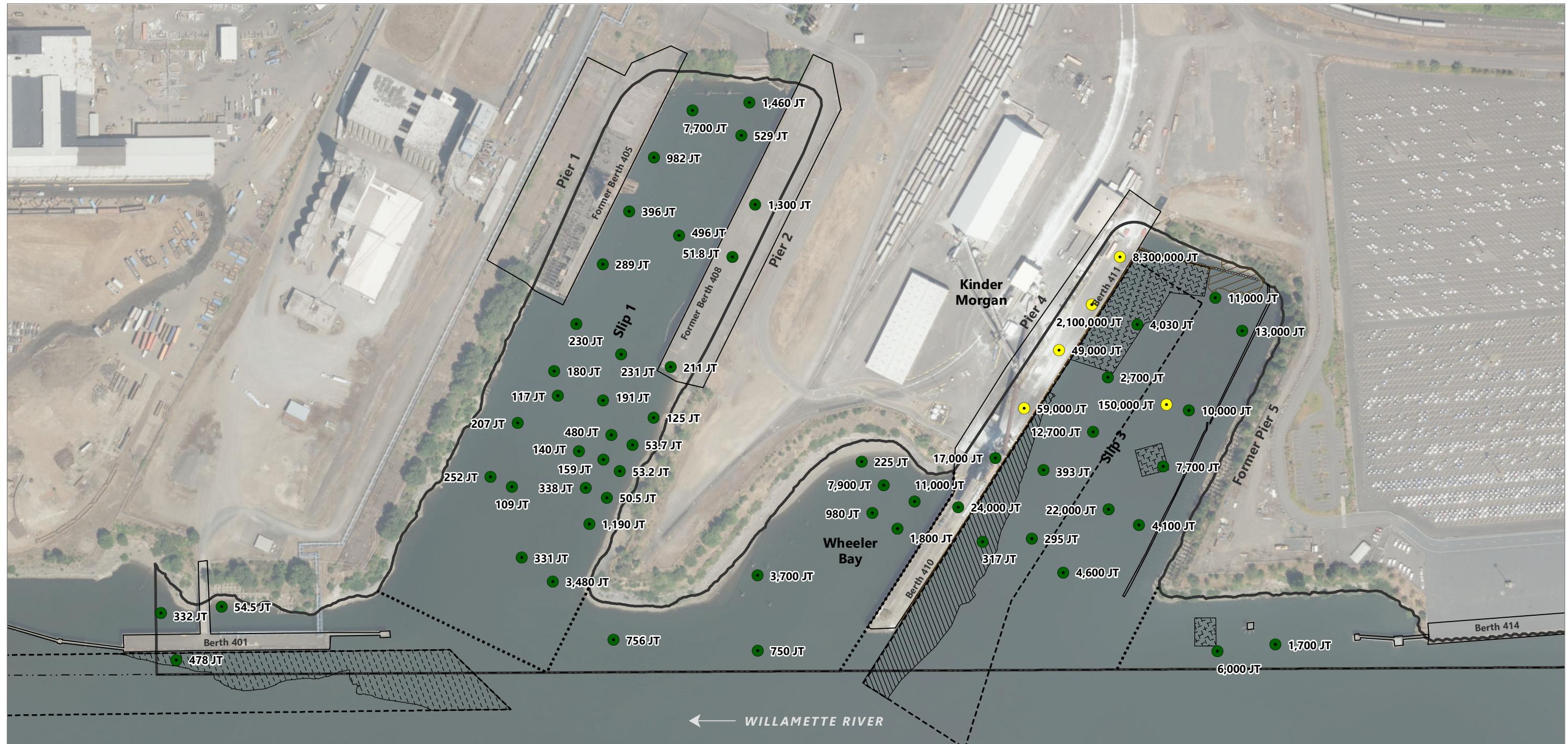
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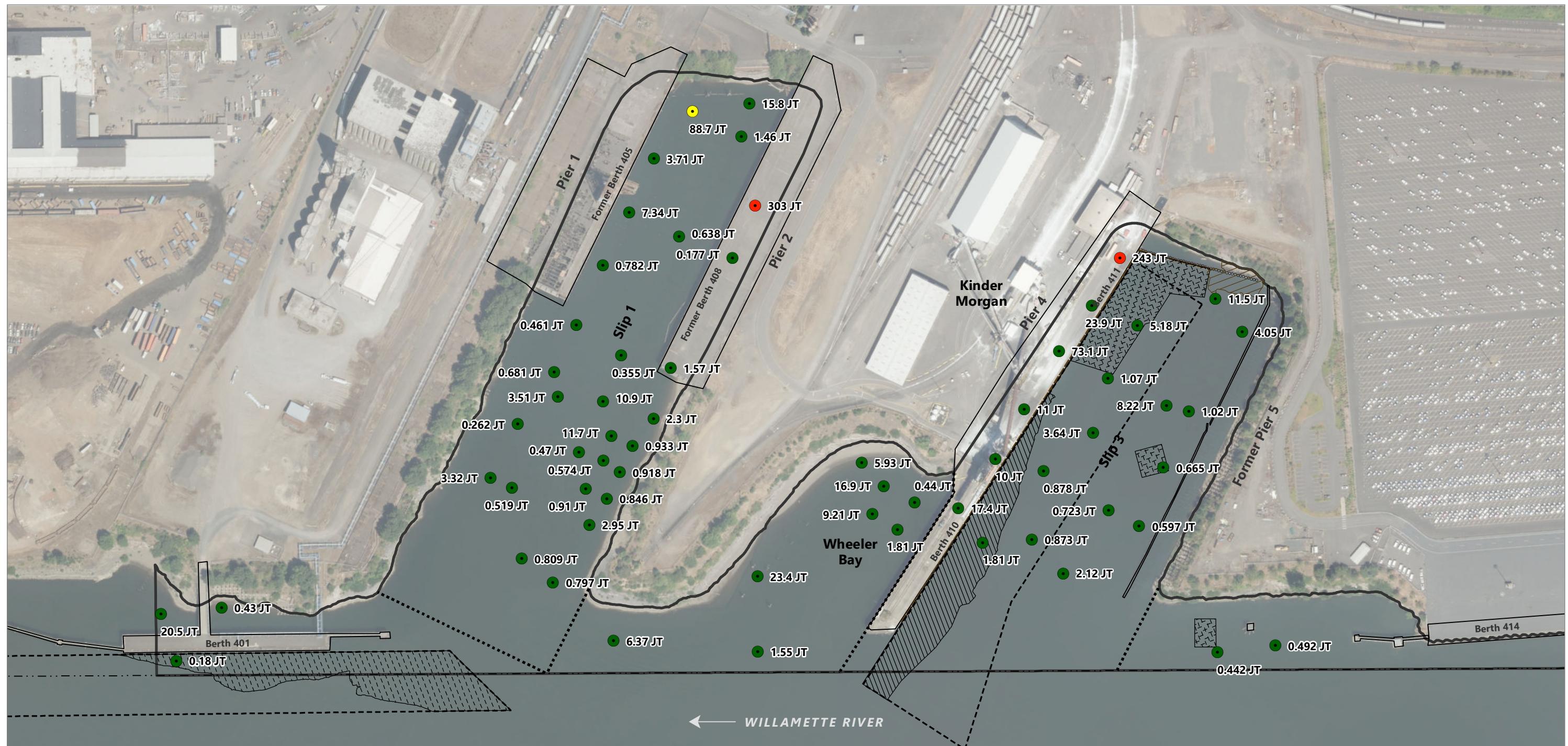
Figure 2-1
Surface Sediment Sampling Locations
Pre-Remedial Design Investigation Summary Report
Terminal 4 Remedy



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LEGEND:

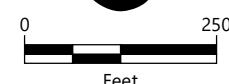
- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations

Total PCBs ($\mu\text{g}/\text{kg}$)

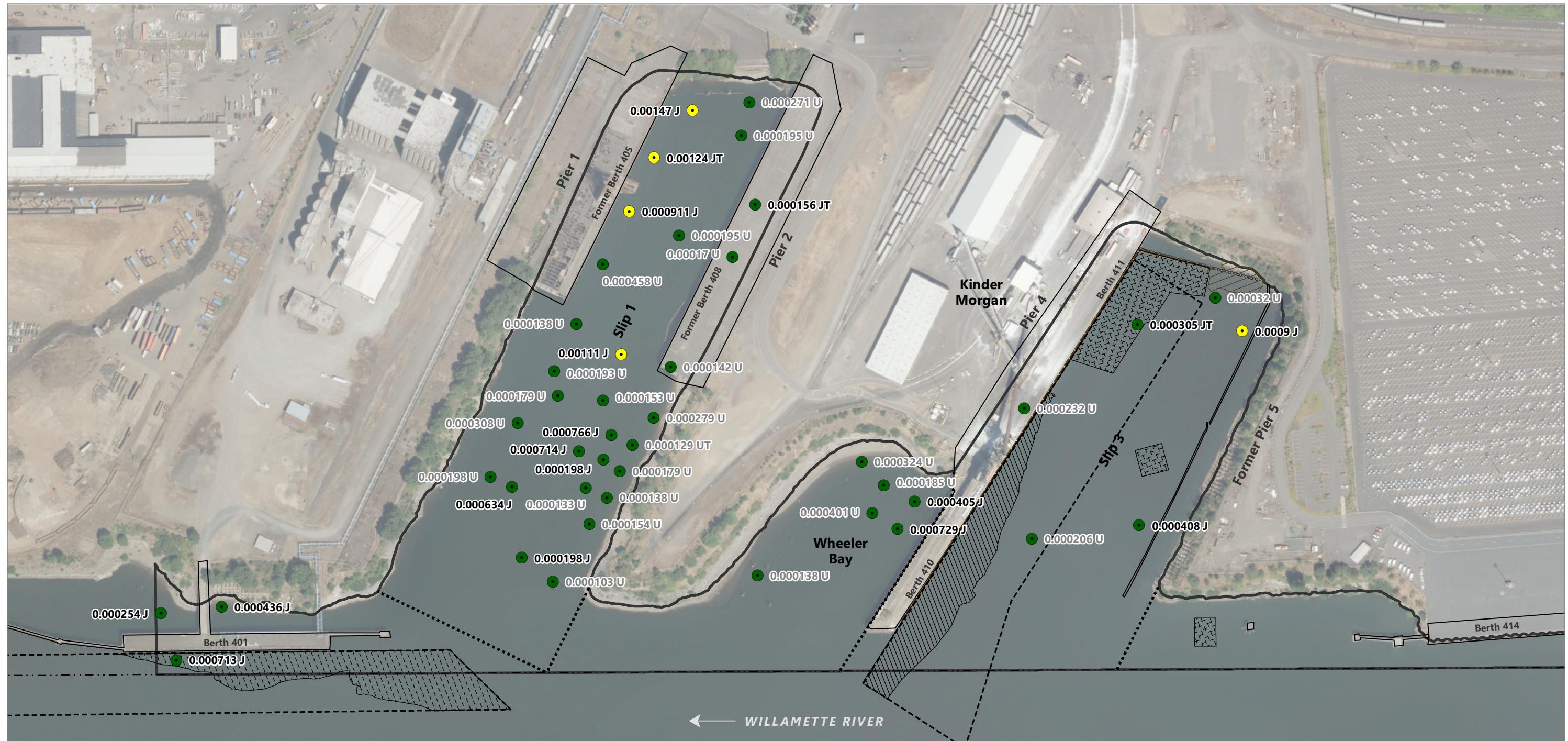
- ≤ 75
- 75.1 - 200 (Exceeds RAL)
- > 200 (Exceeds PTW-Highly Toxic)

NOTES:

- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Gray values with a "U" qualifier represent non-detects.
- Values with a "T" qualifier indicate a calculated or averaged result.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.



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Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig4-2_PreliminaryResults_Surface_tPCB.mxd



LEGEND:

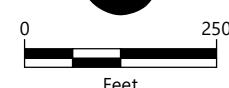
- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations

1,2,3,7,8-PeCDD (µg/kg)

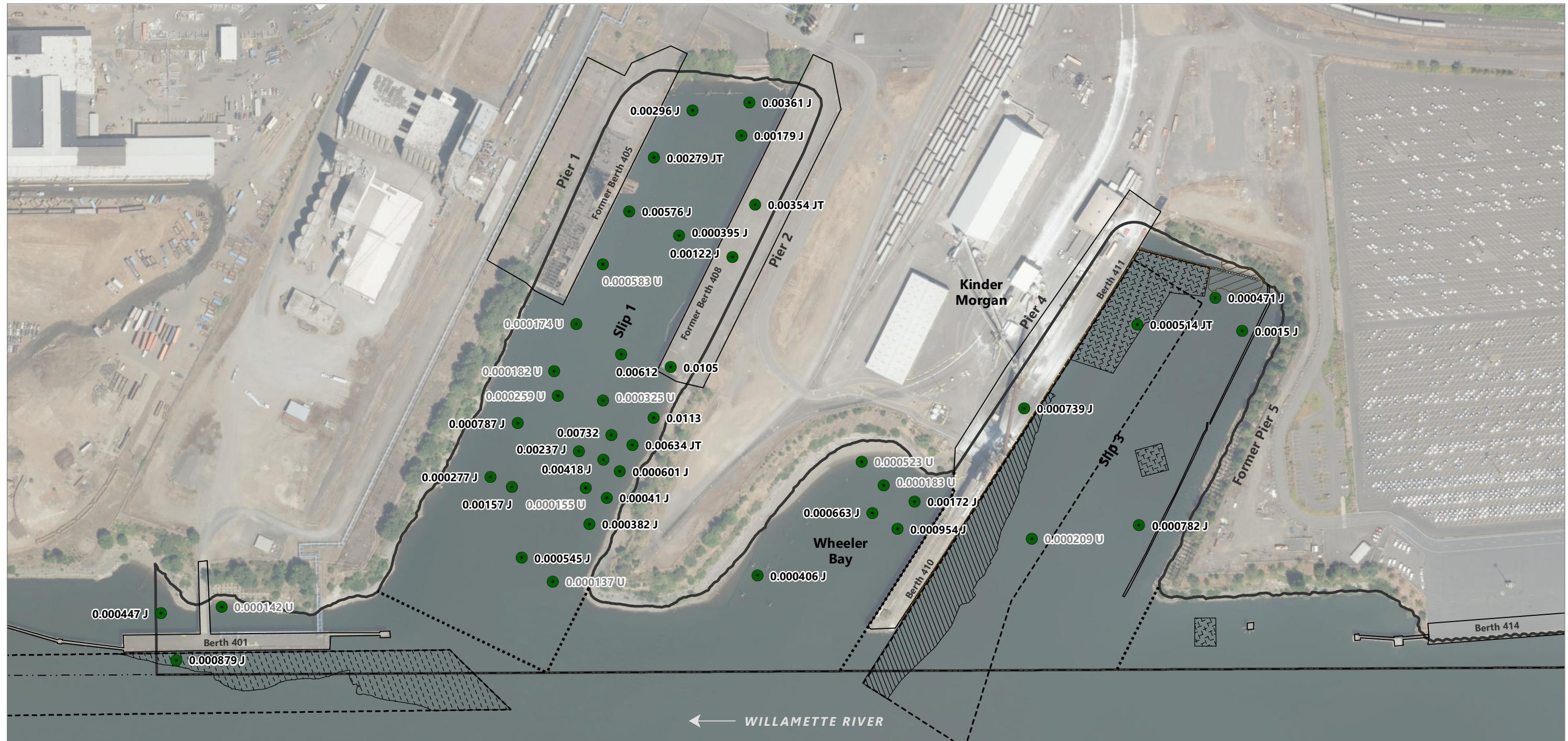
Symbol	Range
Green circle	≤ 0.0008
Yellow circle	0.00081 - 0.01 (Exceeds RAL)
Red circle	> 0.01 (Exceeds PTW-Highly Toxic)

NOTES:

- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Gray values with a "U" qualifier represent non-detects.
- Values with a "T" qualifier indicate a calculated or averaged result.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.



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Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig4-3a_PreliminaryResults_Surface_PeCDD.mxd



LEGEND:

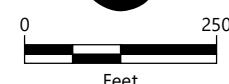
- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations

2,3,4,7,8-PeCDF ($\mu\text{g}/\text{kg}$)

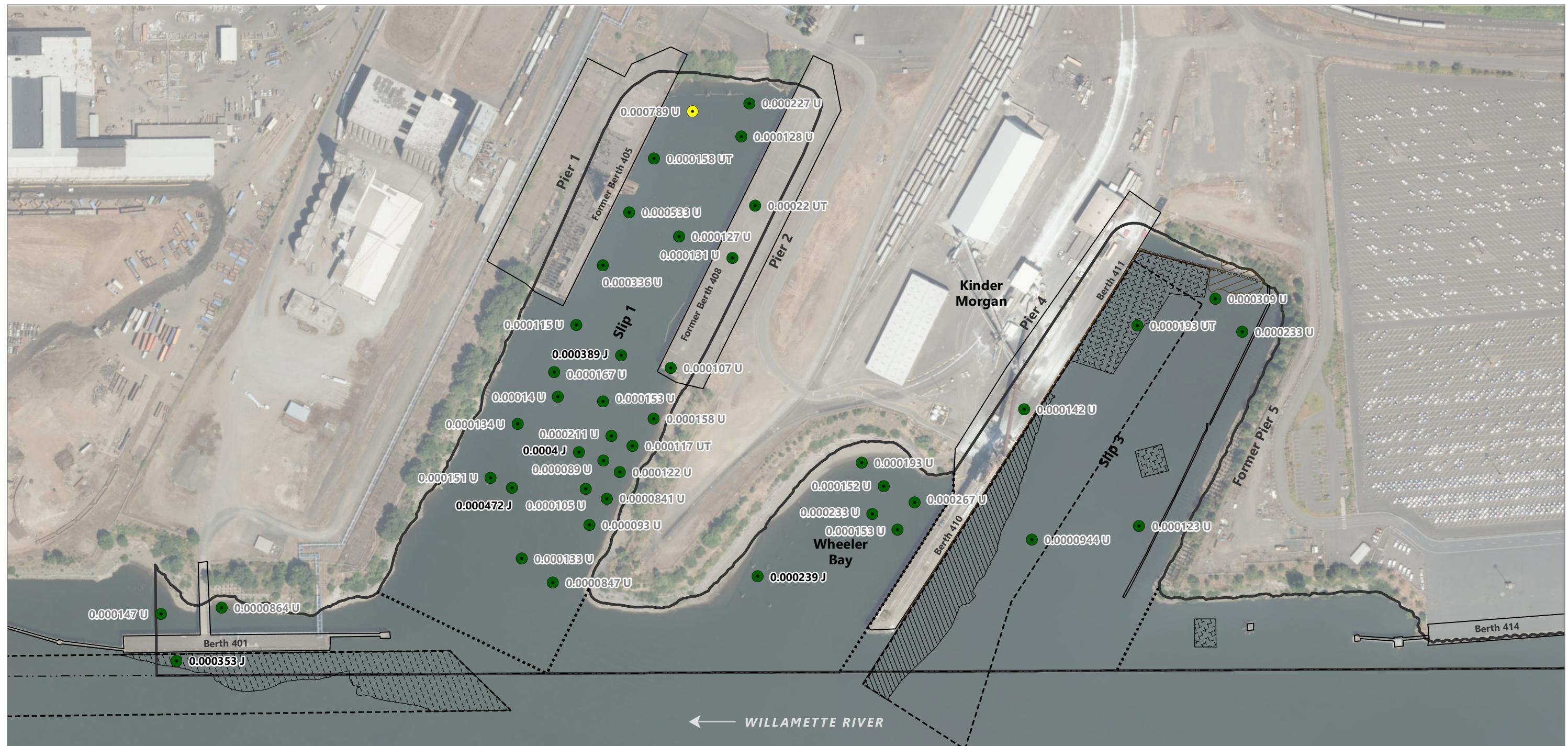
- ≤ 0.2
- > 0.2 (Exceeds RAL/PTW-Highly Toxic)

NOTES:

- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Gray values with a "U" qualifier represent non-detects.
- Values with a "T" qualifier indicate a calculated or averaged result.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.



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Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig4-3b_PreliminaryResults_Surface_PeCDF.mxd



LEGEND:

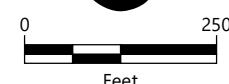
- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations

2,3,7,8-TCDD ($\mu\text{g/kg}$)

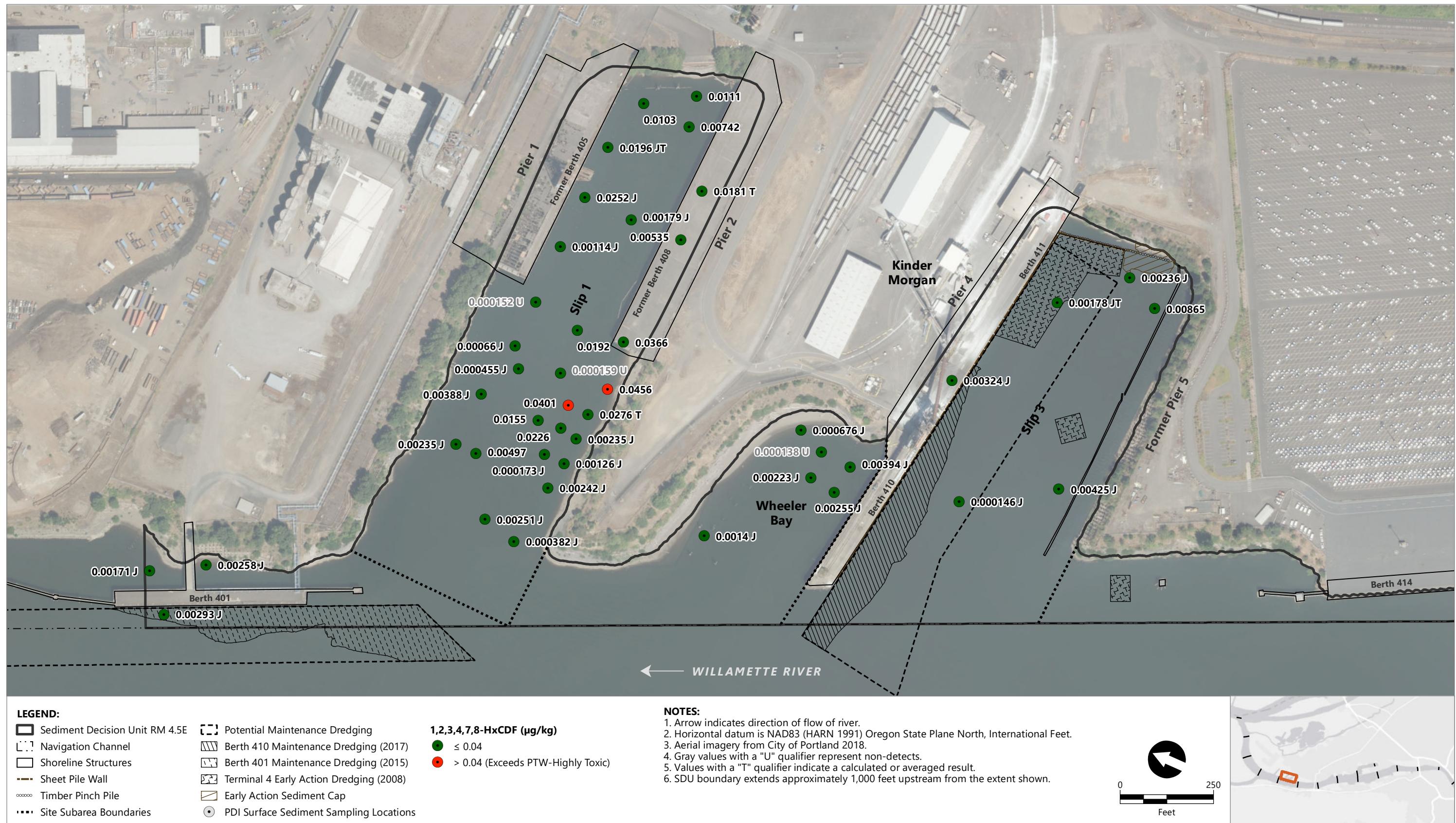
Value Range	Symbol
≤ 0.0006	Green circle
0.00061 - 0.01 (Exceeds RAL)	Yellow circle
> 0.01 (Exceeds PTW-Highly Toxic)	Red circle

NOTES:

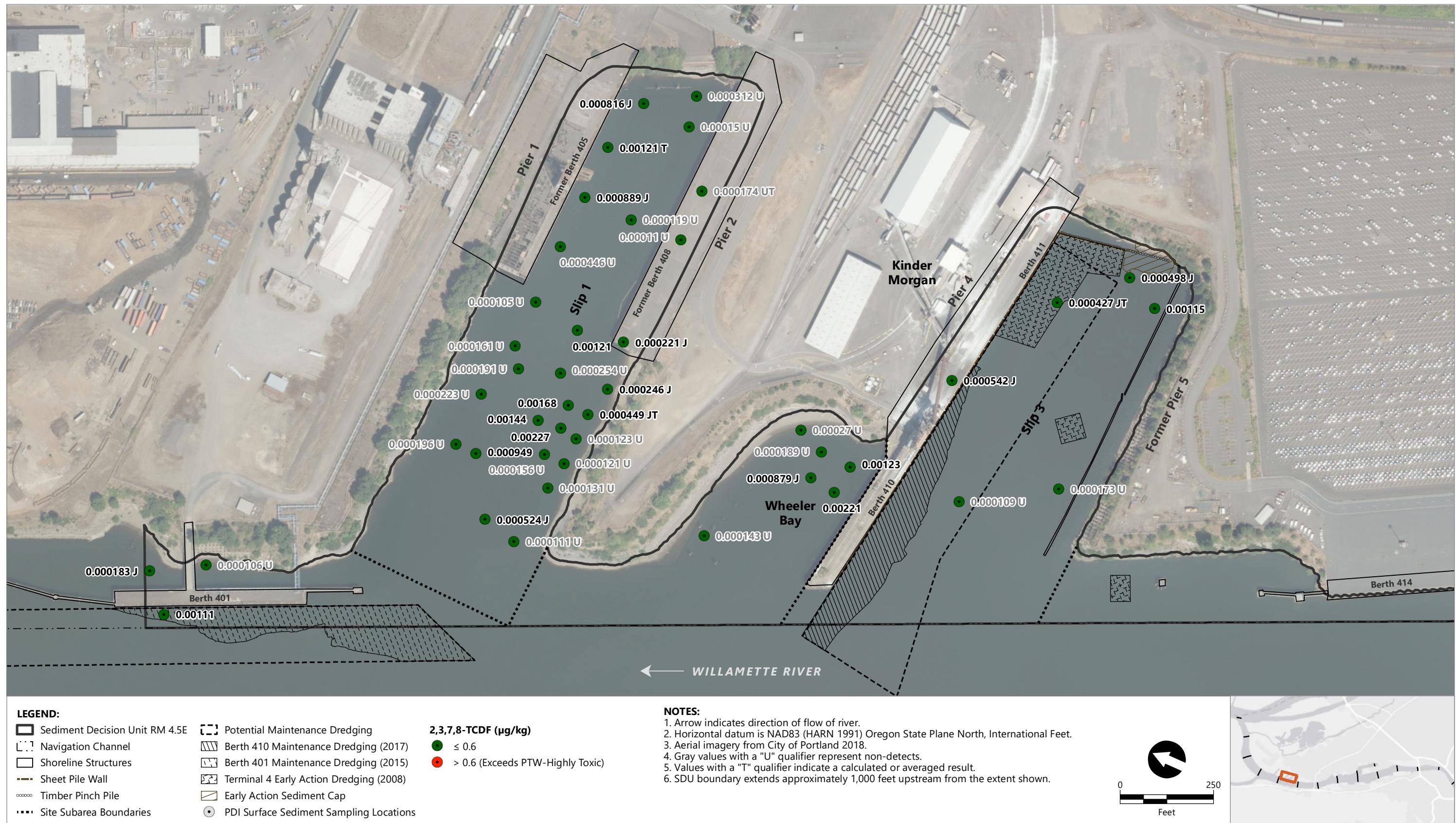
- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Gray values with a "U" qualifier represent non-detects.
- Values with a "T" qualifier indicate a calculated or averaged result.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.



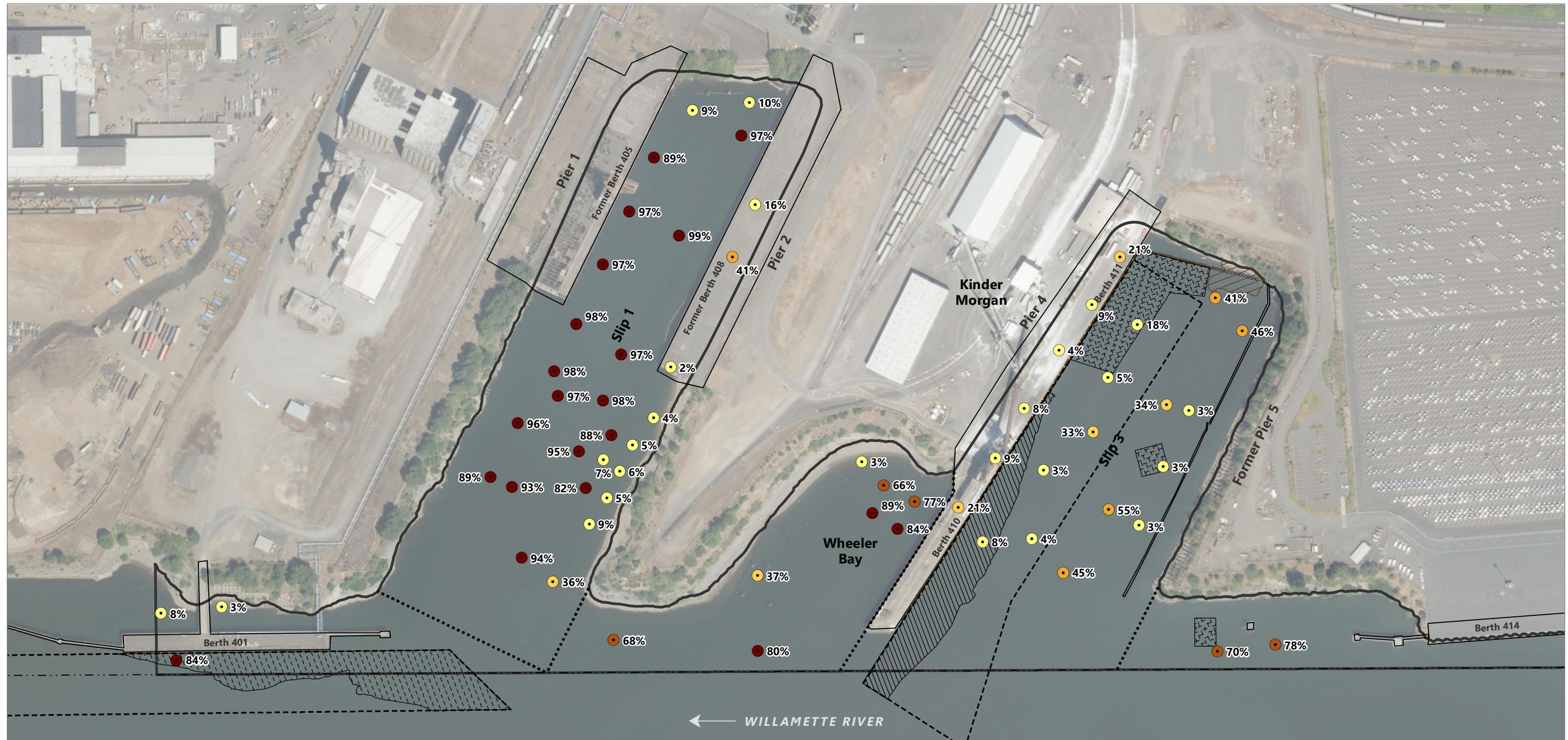
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Publish Date: 2020/08/04, 5:38 PM | User: eiverson
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Publish Date: 2020/08/04, 5:38 PM | User: eiverson
Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig4-3e_PreliminaryResults_Surface_TCDF.mxd



LEGEND:

- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries

Potential Maintenance Dredging

Berth 410 Maintenance Dredging (2017)

Berth 401 Maintenance Dredging (2015)

Terminal 4 Early Action Dredging (2008)

Early Action Sediment Cap

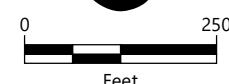
PDI Surface Sediment Sampling Locations

Percent Fines

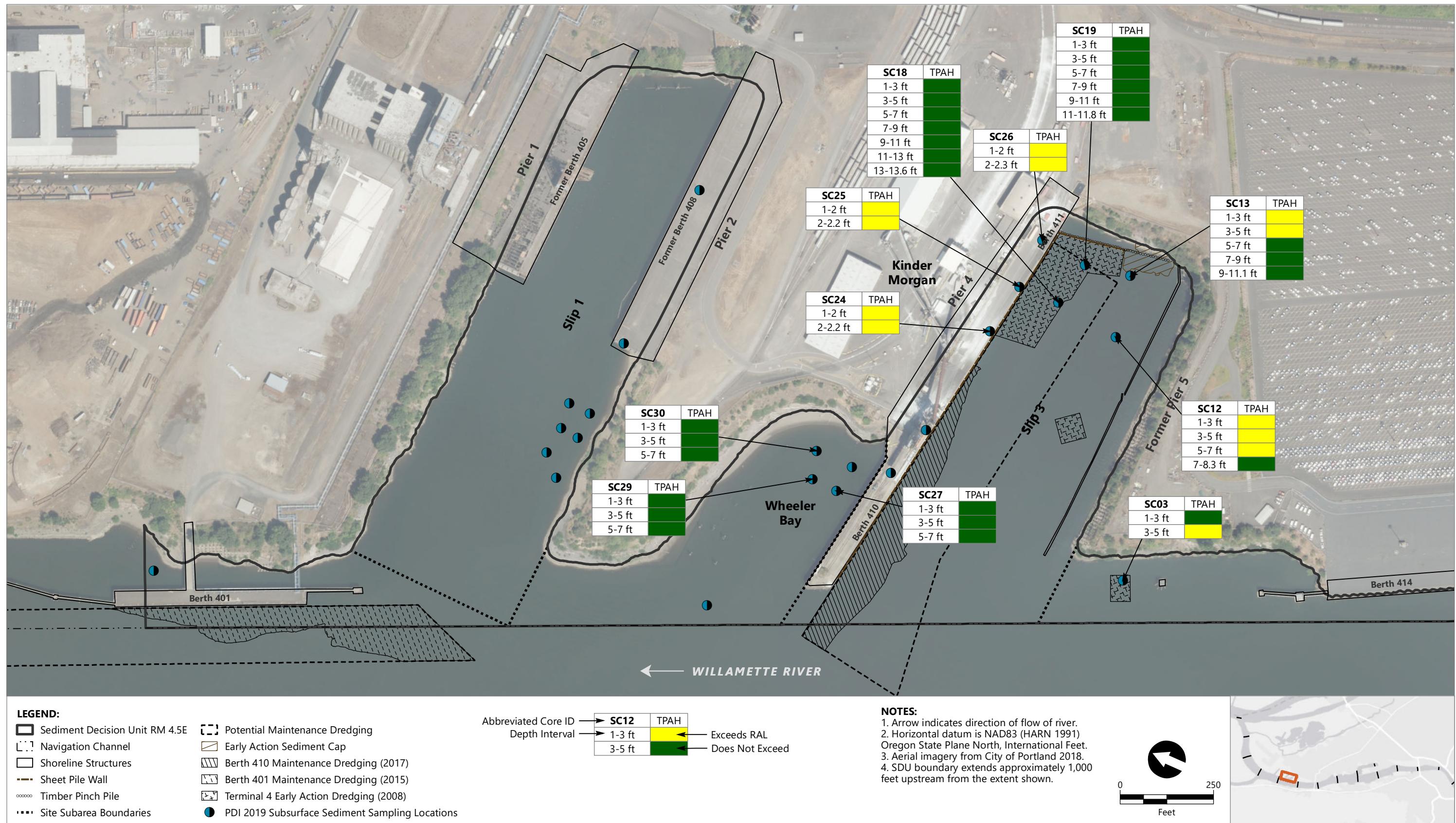
0% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%

NOTES:

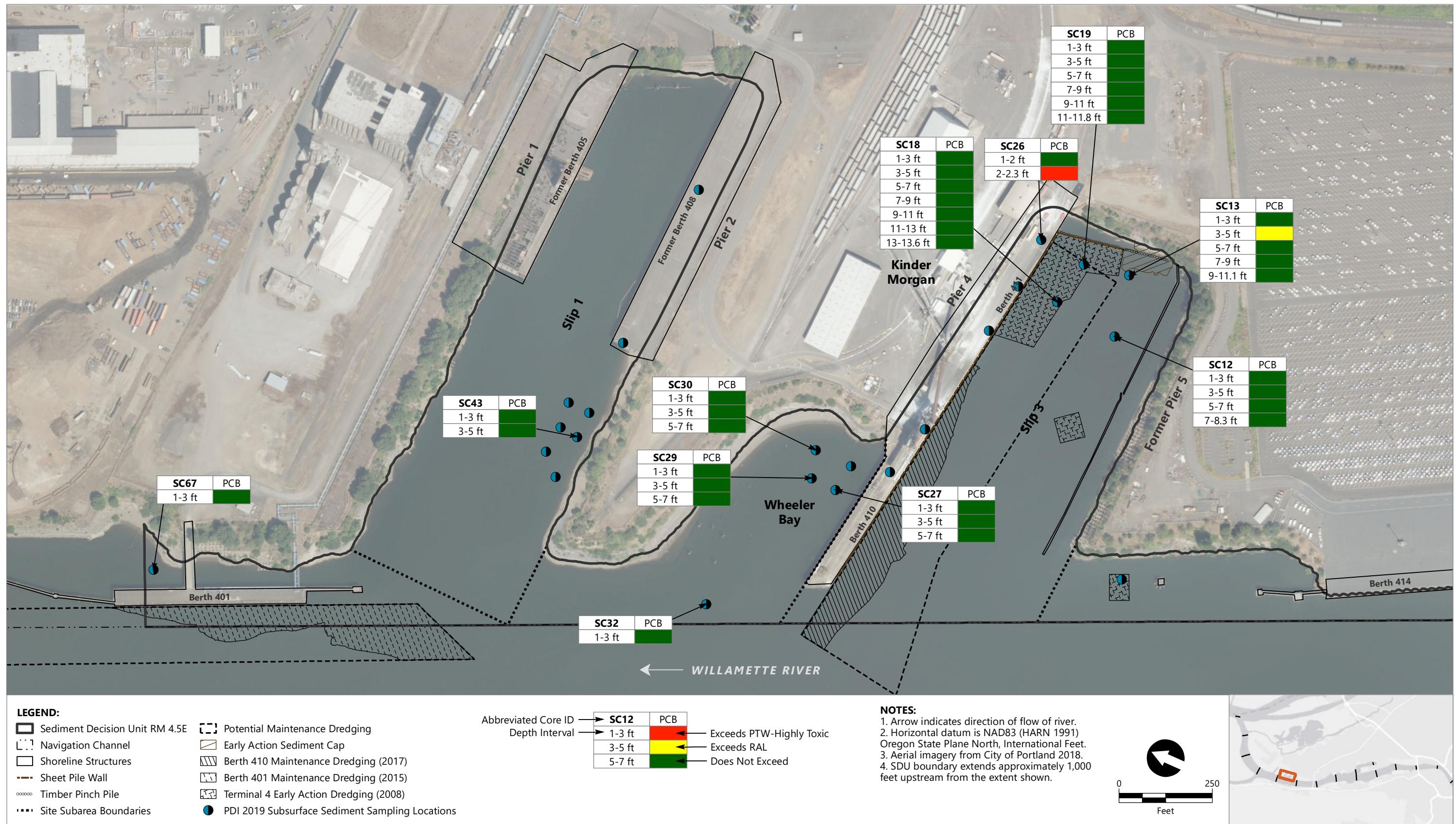
- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Gray values with a "U" qualifier represent non-detects.
- Values with a "T" qualifier indicate a calculated or averaged result.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.



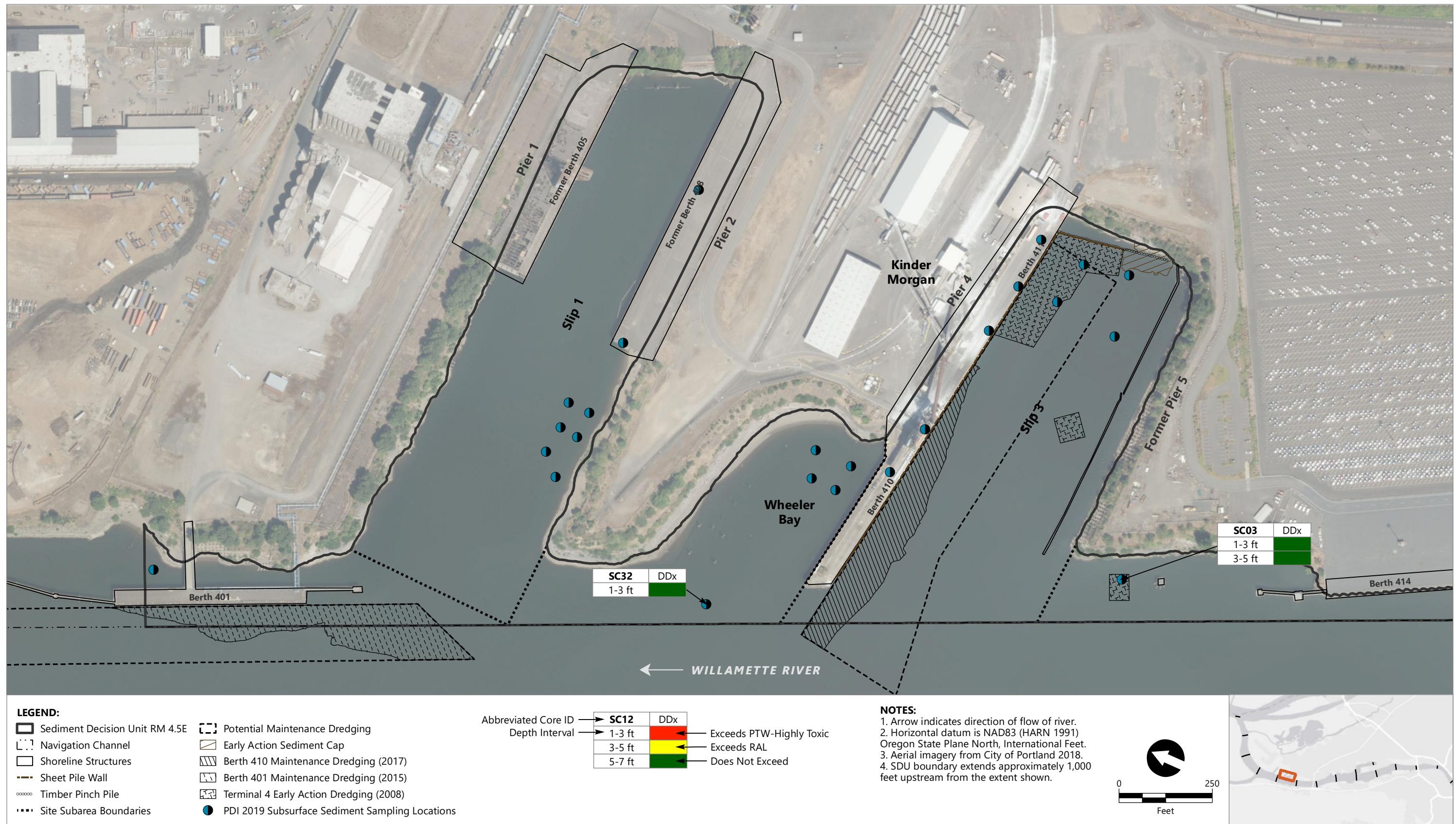
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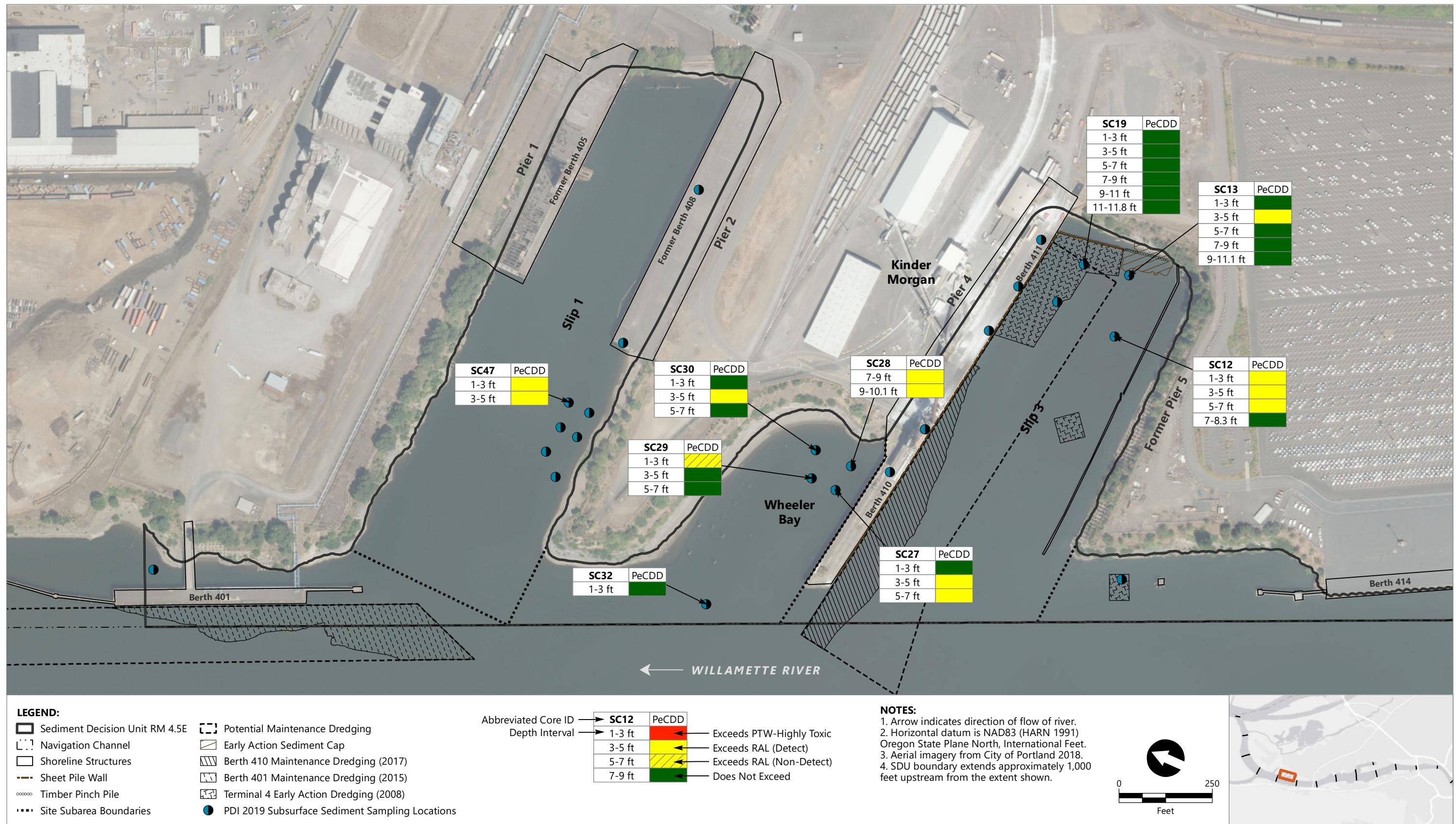
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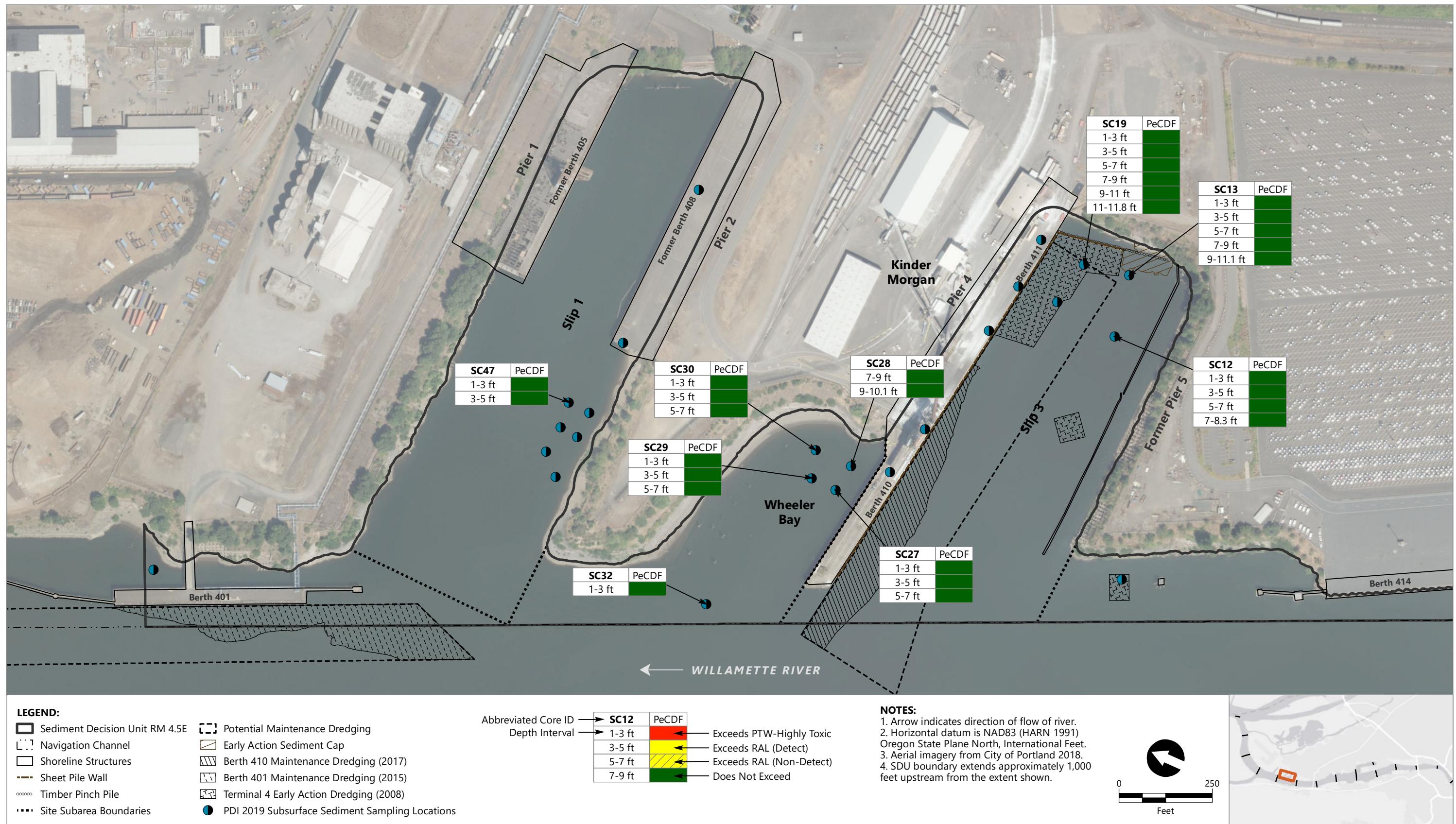
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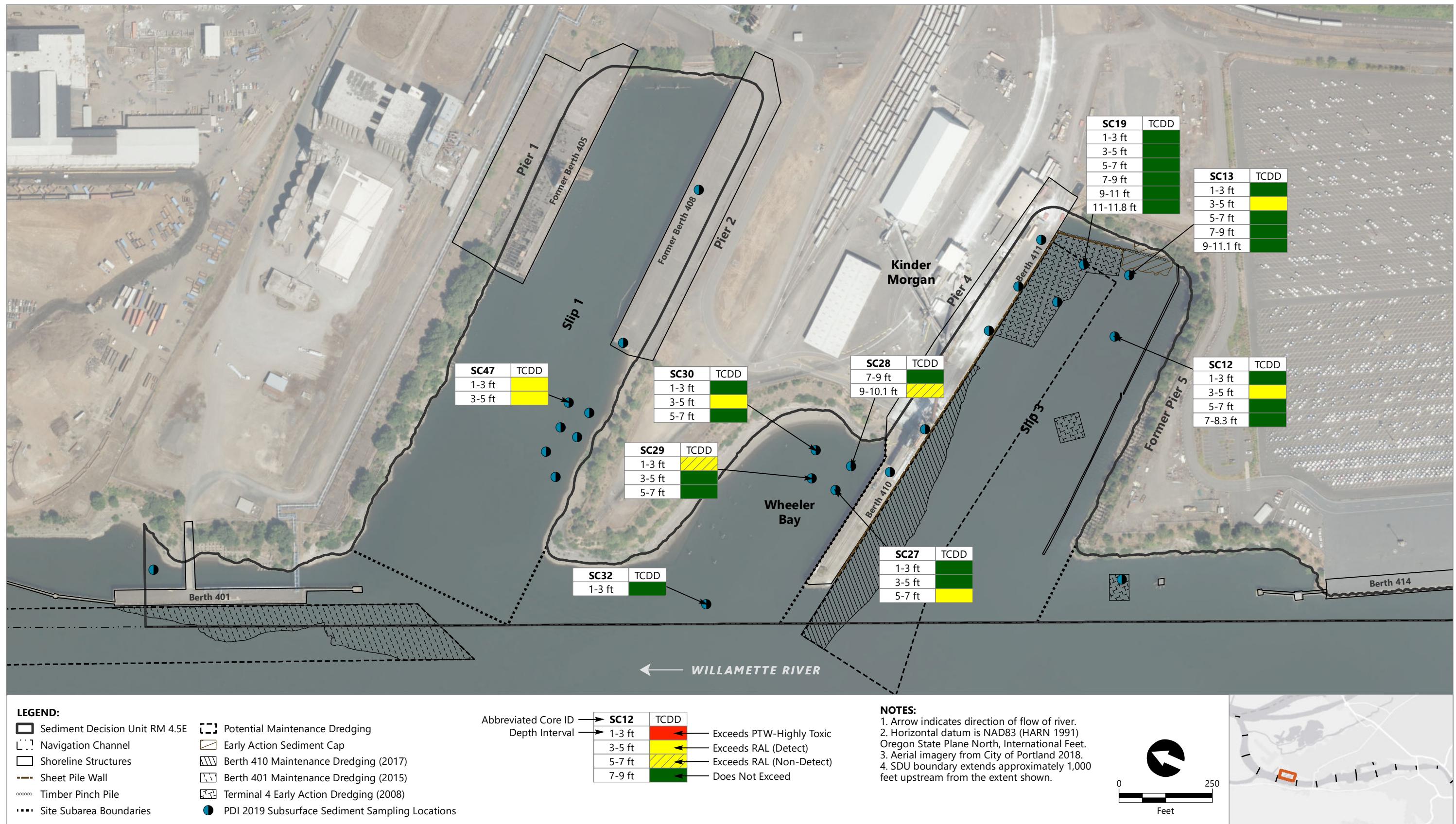
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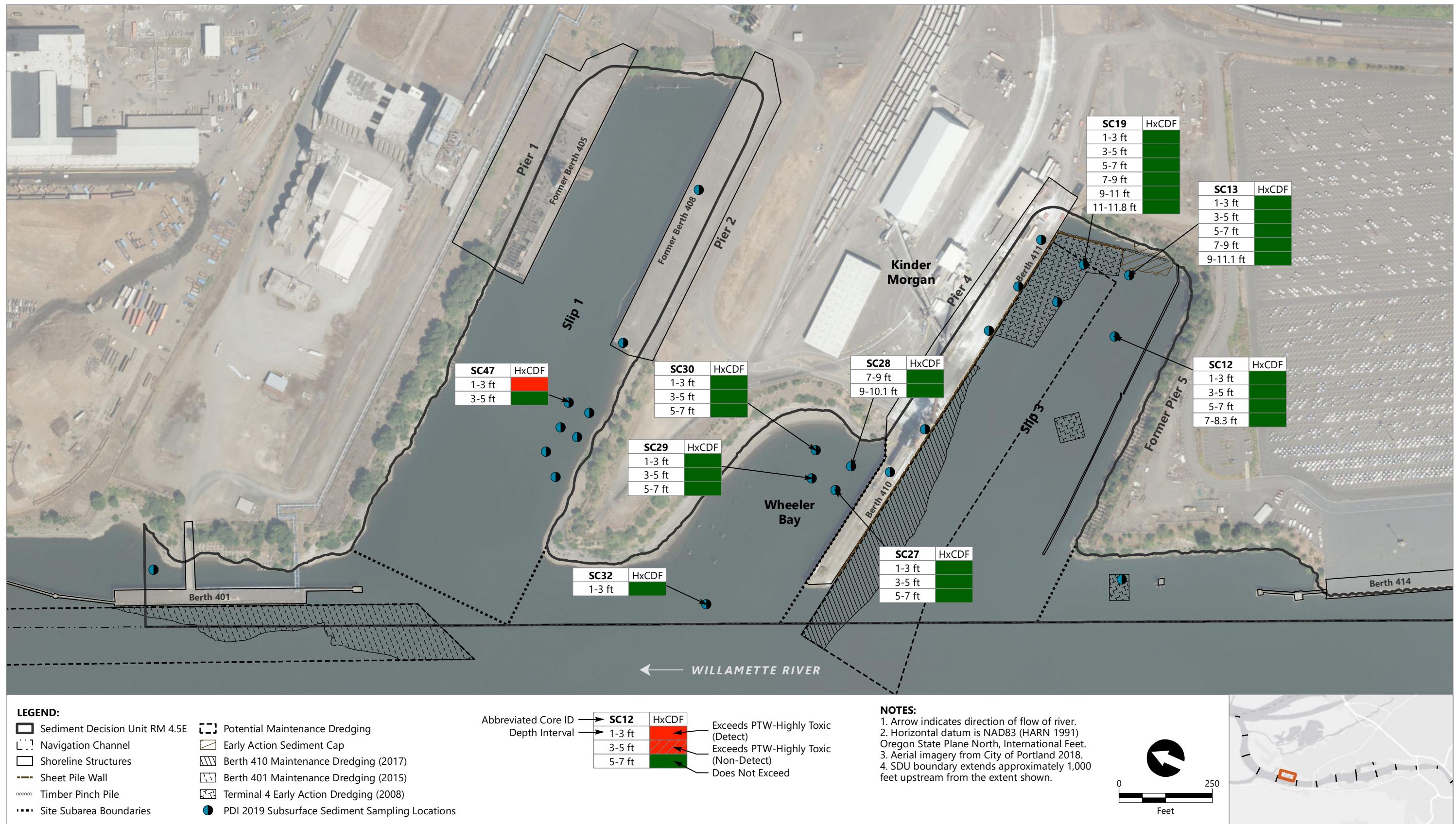
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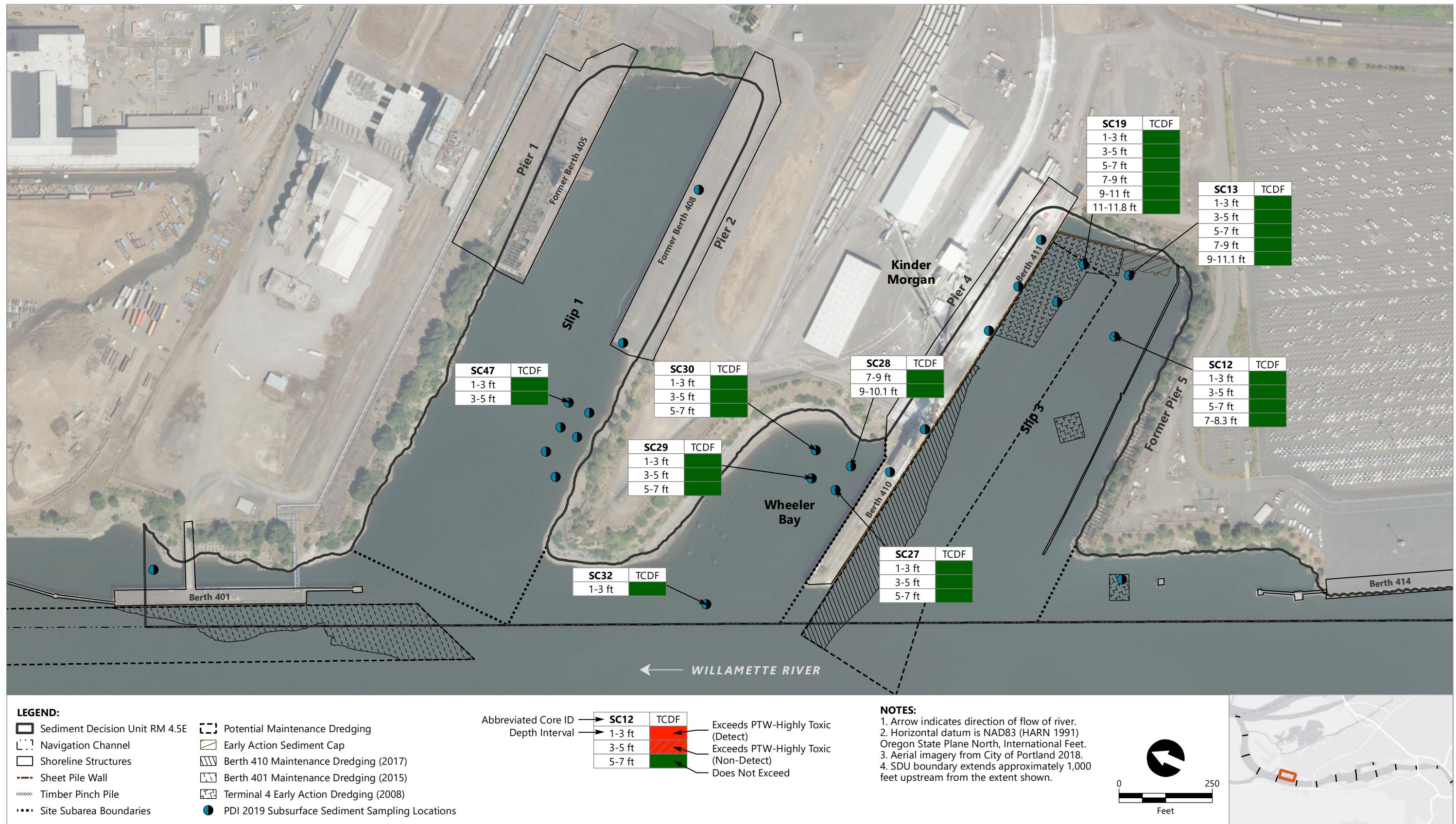
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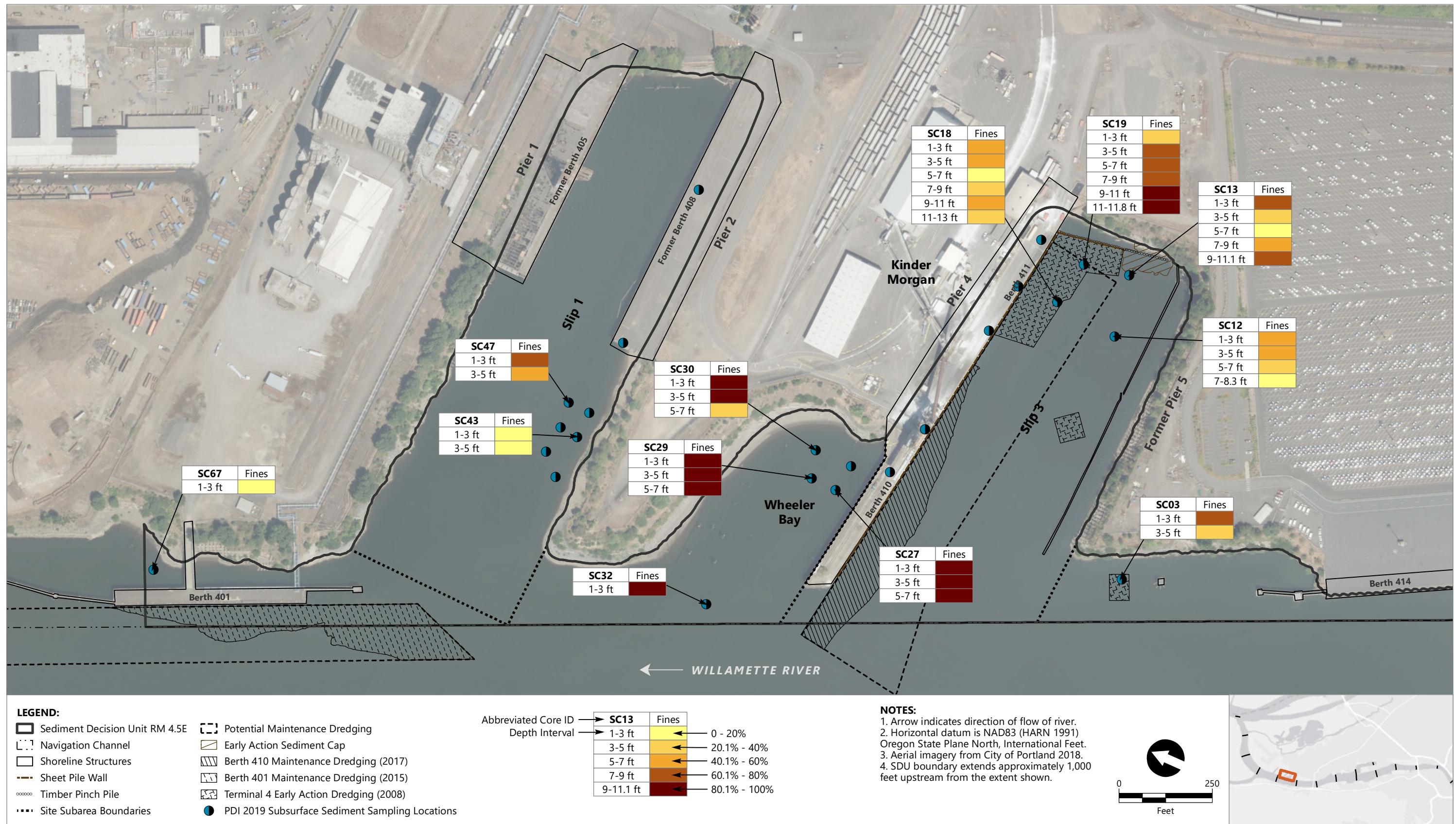
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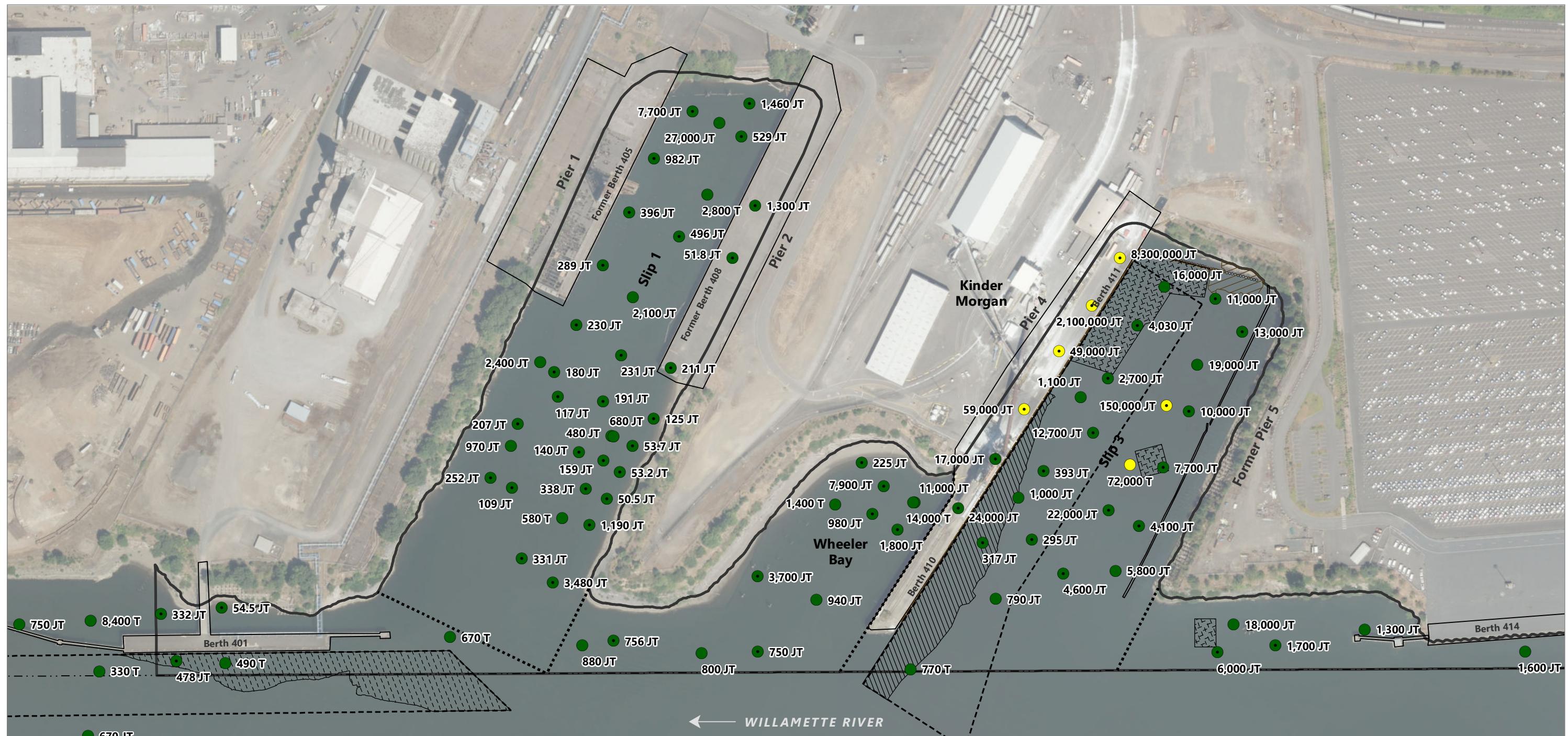
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Publish Date: 2020/06/04, 8:56 AM | User: eiverson
Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig5-4e_Subsurface_TCDF.mxd



Publish Date: 2020/08/04, 4:52 PM | User: eiverson
Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig5-5_Subsurface_Fines.mxd



NOTES:

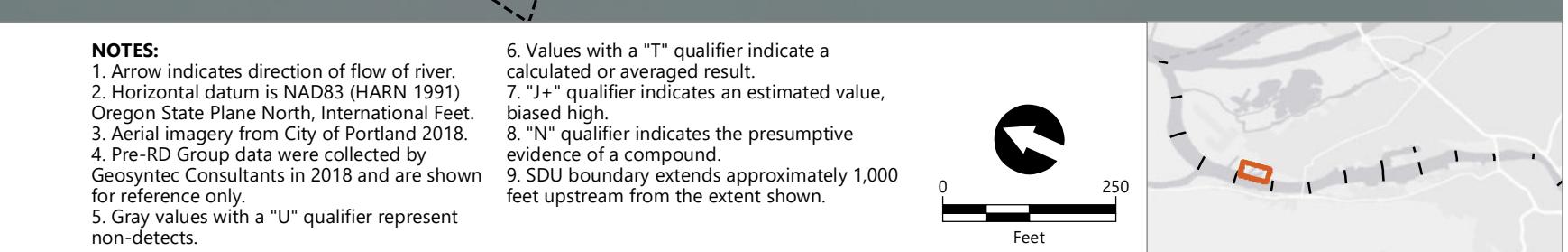
1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
3. Aerial imagery from City of Portland 2018.
4. Pre-RD Group data were collected by Geosyntec Consultants in 2018 and are shown for reference only.
5. Gray values with a "U" qualifier represent non-detects.
6. Values with a "T" qualifier indicate a calculated or averaged result.
7. "J+" qualifier indicates an estimated value, biased high.
8. "N" qualifier indicates the presumptive evidence of a compound.
9. SDU boundary extends approximately 1,000 feet upstream from the extent shown.

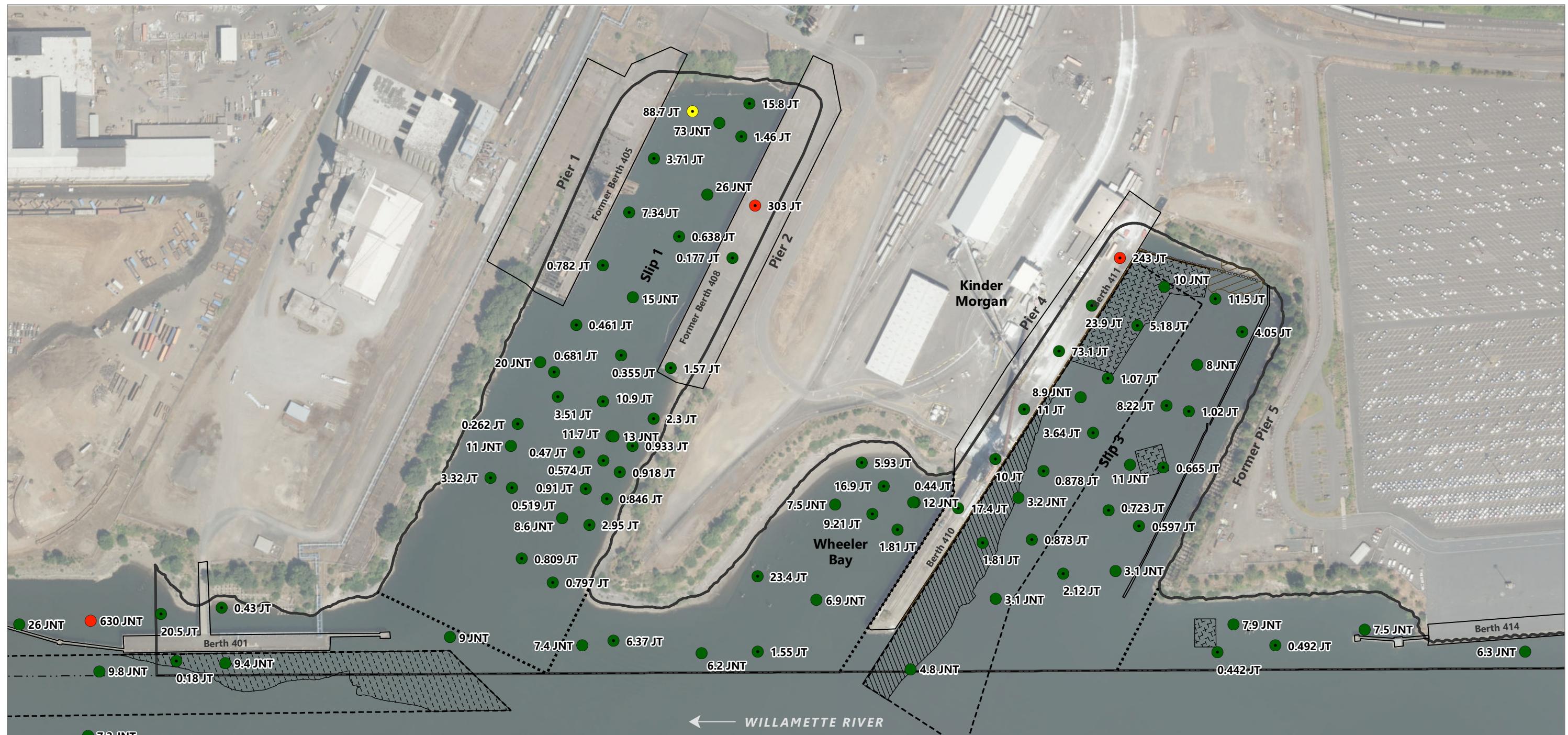
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Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig6-1a_PreliminaryResults_Surface_tPAH.mxd



Figure 6-1a
PDI and Pre-RD Group Surface Sediment Concentrations – Total PAHs

Pre-Remedial Design Investigation Summary Report
Terminal 4 Remedy





LEGEND:

- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations
- Pre-RD Group Surface Sediment Sampling Locations

Publish Date: 2020/08/04, 5:39 PM | User: eiverson
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NOTES:

- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Pre-RD Group data were collected by Geosyntec Consultants in 2018 and are shown for reference only.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.
- Values with a "T" qualifier indicate a calculated or averaged result.
- "J+" qualifier indicates an estimated value, biased high.
- "N" qualifier indicates the presumptive evidence of a compound.
- Gray values with a "U" qualifier represent non-detects.

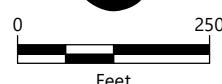
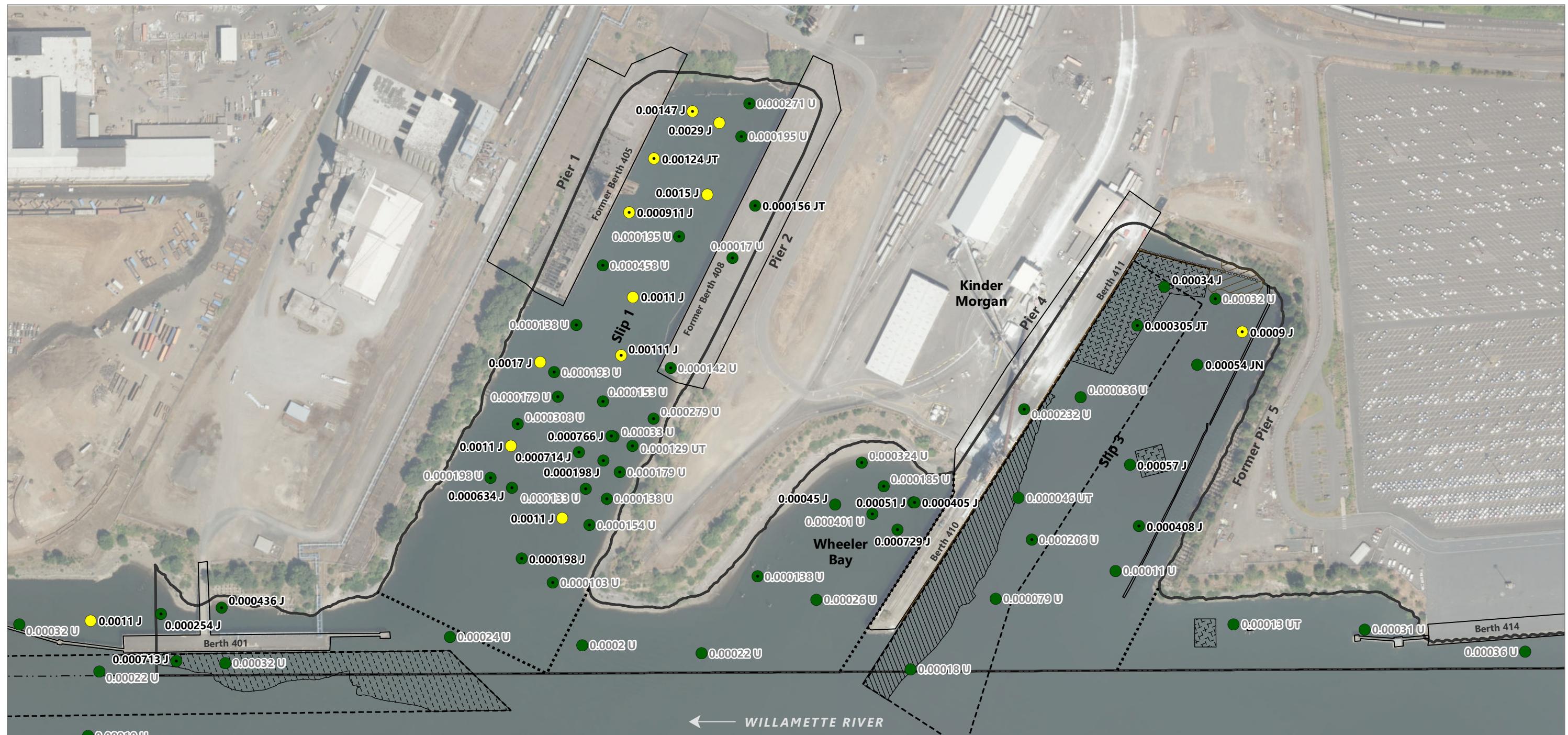


Figure 6-1b
PDI and Pre-RD Group Surface Sediment Concentrations – Total PCBs

Pre-Remedial Design Investigation Summary Report
Terminal 4 Remedy



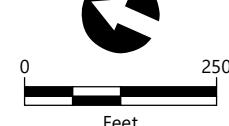
LEGEND:

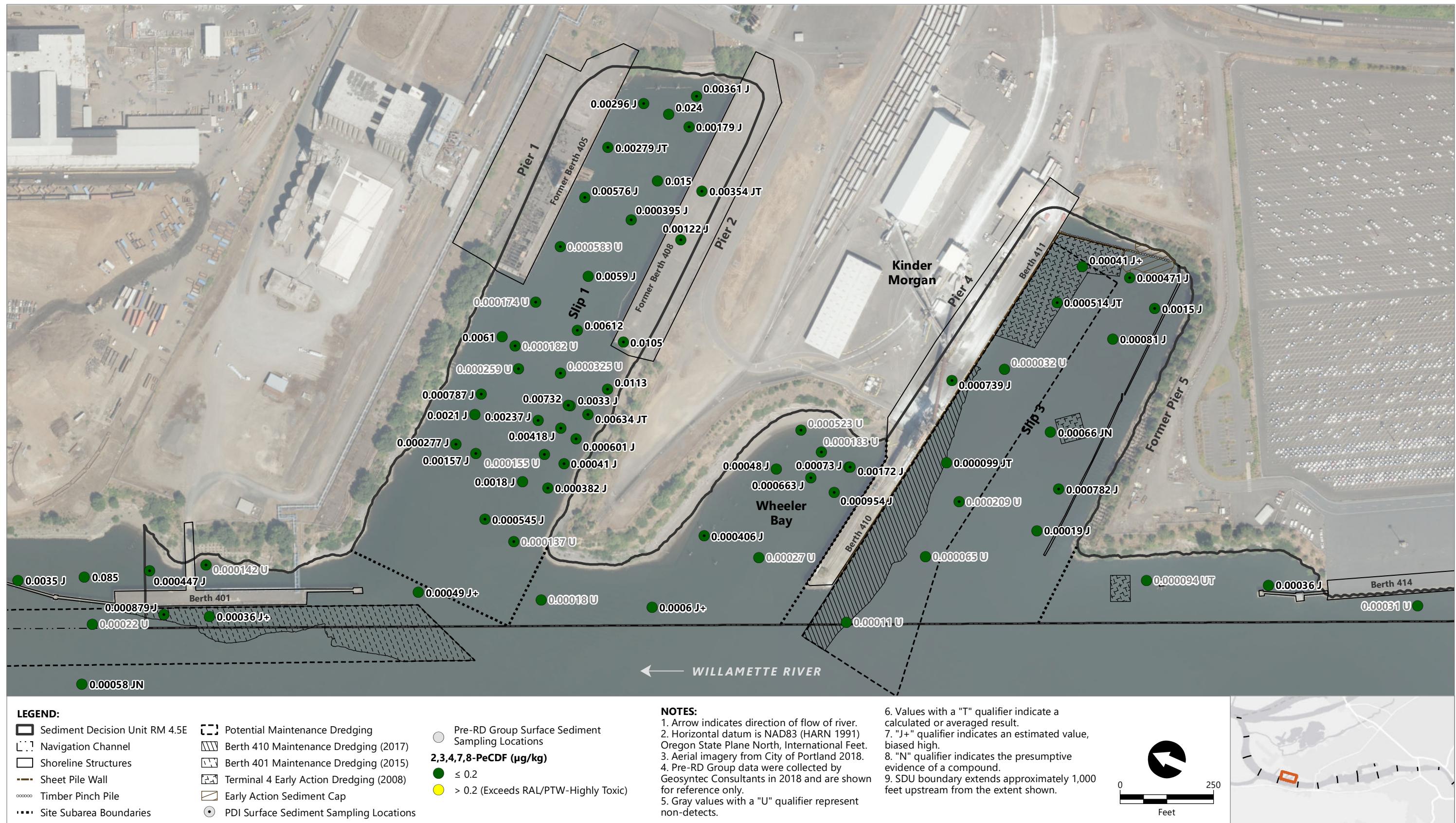
- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations
- Pre-RD Group Surface Sediment Sampling Locations
- 1,2,3,7,8-PeCDD ($\mu\text{g}/\text{kg}$)
- ≤ 0.0008
- $0.00081 - 0.01$ (Exceeds RAL)
- > 0.01 (Exceeds PTW-Highly Toxic)

Publish Date: 2020/08/04, 5:39 PM | User: eiverson
Filepath: \\orcas\GIS\Jobs\PortofPortland_0332\PortlandHarborFS\Maps\Reports\PDISamplingReport\AQ_PDI2019_Fig6-1c_PreliminaryResults_Surface_PeCDD.mxd

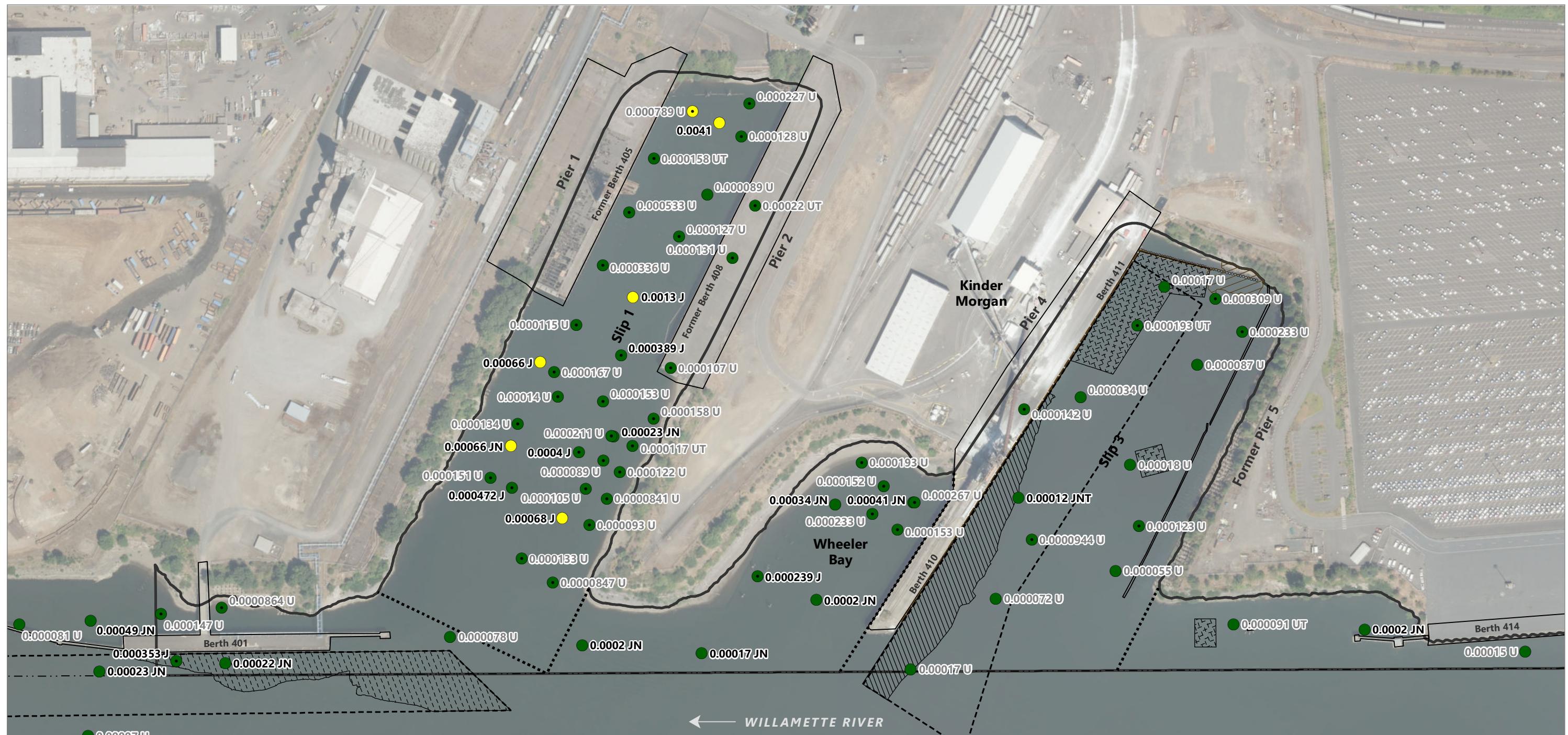
NOTES:

- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Pre-RD Group data were collected by Geosyntec Consultants in 2018 and are shown for reference only.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.
- Values with a "T" qualifier indicate a calculated or averaged result.
- "J+" qualifier indicates an estimated value, biased high.
- "N" qualifier indicates the presumptive evidence of a compound.





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LEGEND:

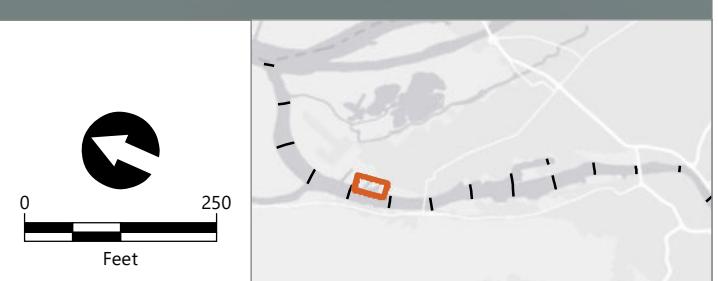
- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations
- Pre-RD Group Surface Sediment Sampling Locations

2,3,7,8-TCDD ($\mu\text{g}/\text{kg}$)

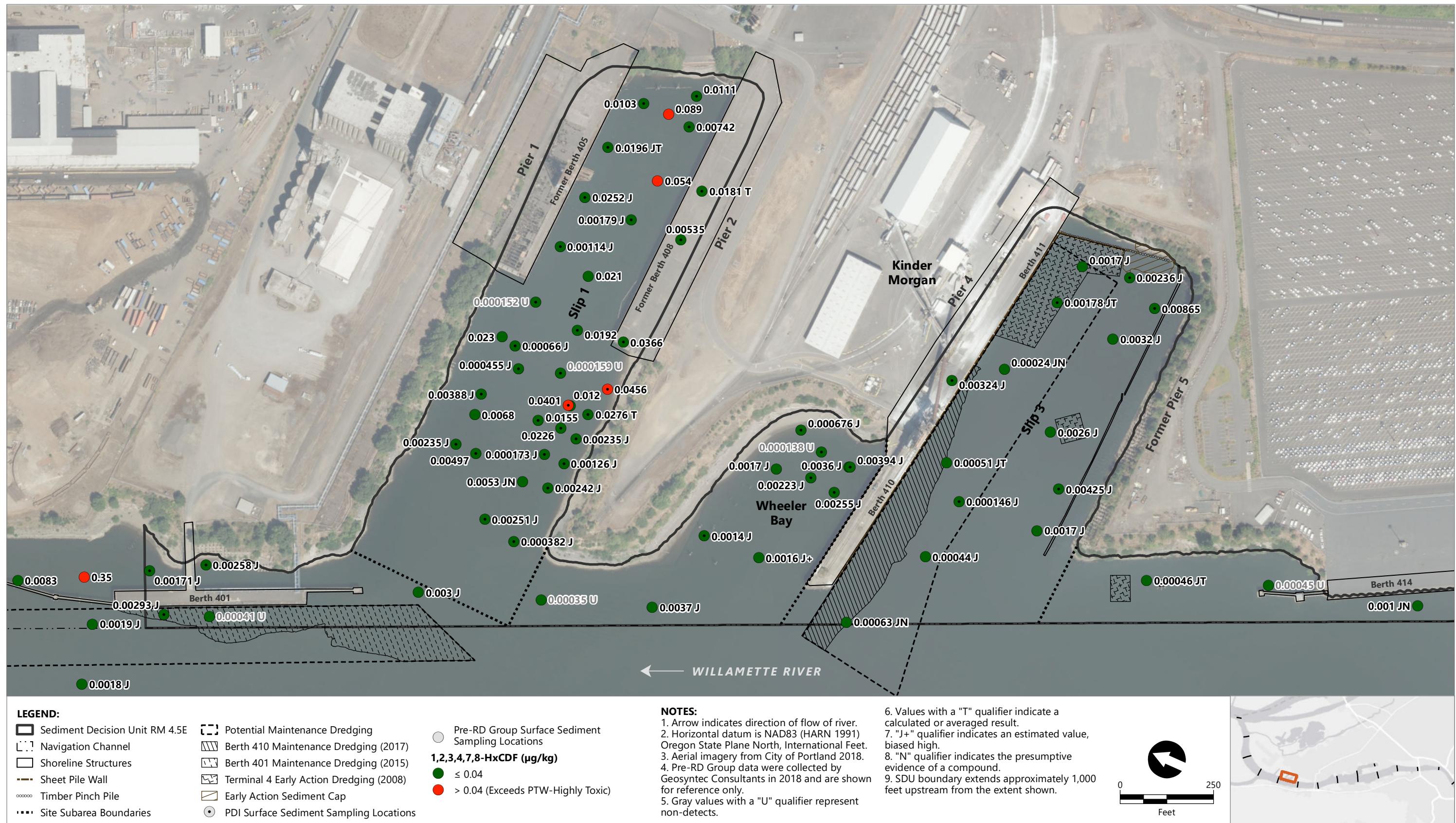
Concentration Range	Symbol Description
≤ 0.0006	Small dark green dot
$0.00061 - 0.01$ (Exceeds RAL)	Large yellow dot
> 0.01 (Exceeds PTW-Highly Toxic)	Red dot

NOTES:

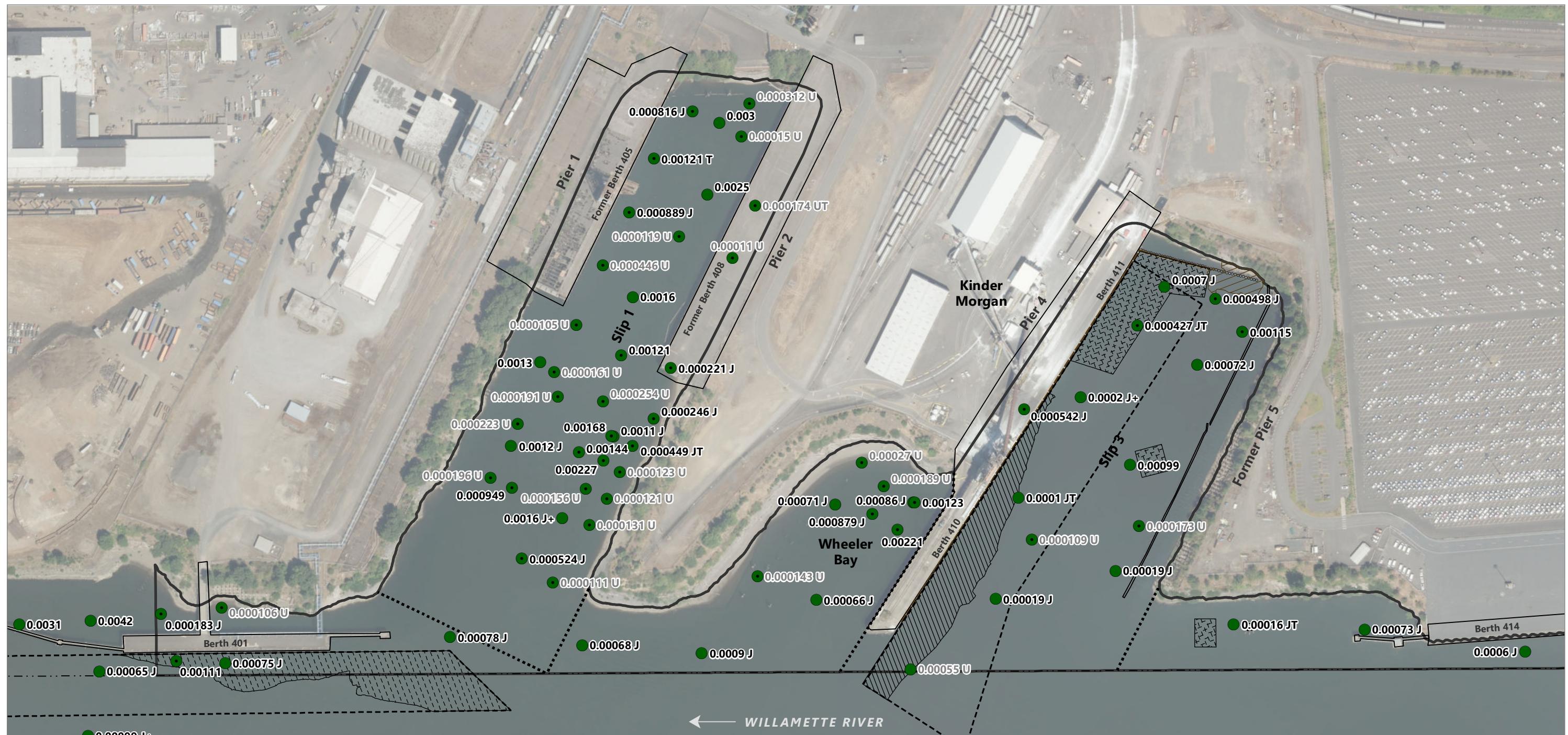
- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Pre-RD Group data were collected by Geosyntec Consultants in 2018 and are shown for reference only.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.
- Values with a "T" qualifier indicate a calculated or averaged result.
- "J+" qualifier indicates an estimated value, biased high.
- "N" qualifier indicates the presumptive evidence of a compound.



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LEGEND:

- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- Early Action Sediment Cap
- PDI Surface Sediment Sampling Locations
- Pre-RD Group Surface Sediment Sampling Locations

2,3,7,8-TCDF ($\mu\text{g/kg}$)

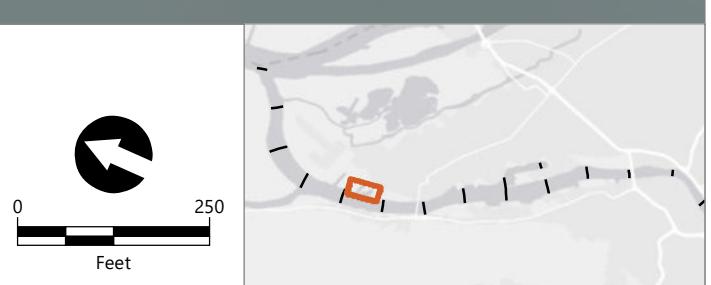
≤ 0.6	> 0.6 (Exceeds PTW-Highly Toxic)
-------	----------------------------------

Pre-RD Group Surface Sediment Sampling Locations

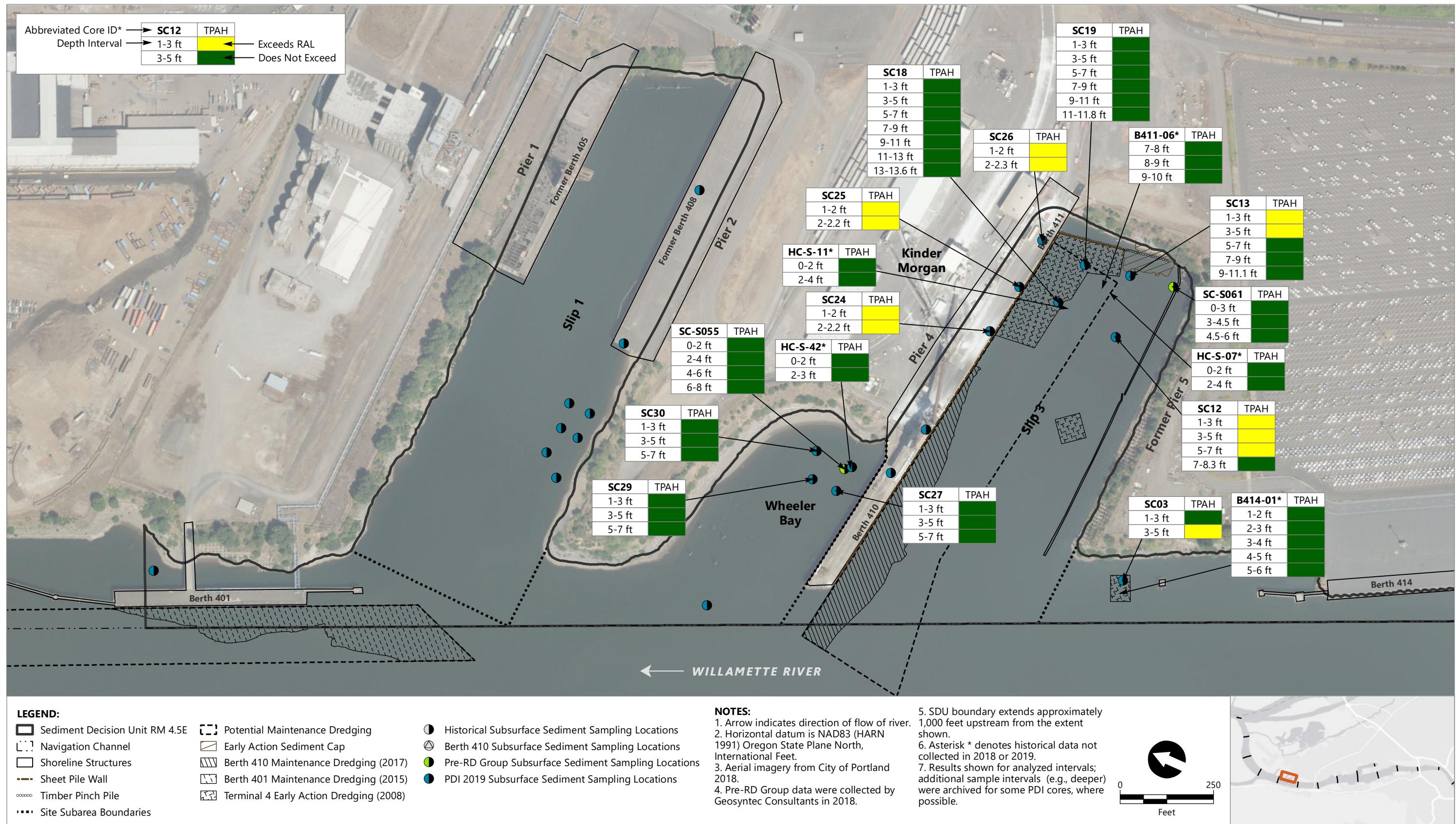
NOTES:

- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
- Aerial imagery from City of Portland 2018.
- Pre-RD Group data were collected by Geosyntec Consultants in 2018 and are shown for reference only.
- SDU boundary extends approximately 1,000 feet upstream from the extent shown.
- Values with a "T" qualifier indicate a calculated or averaged result.
- "J+" qualifier indicates an estimated value, biased high.
- "N" qualifier indicates the presumptive evidence of a compound.

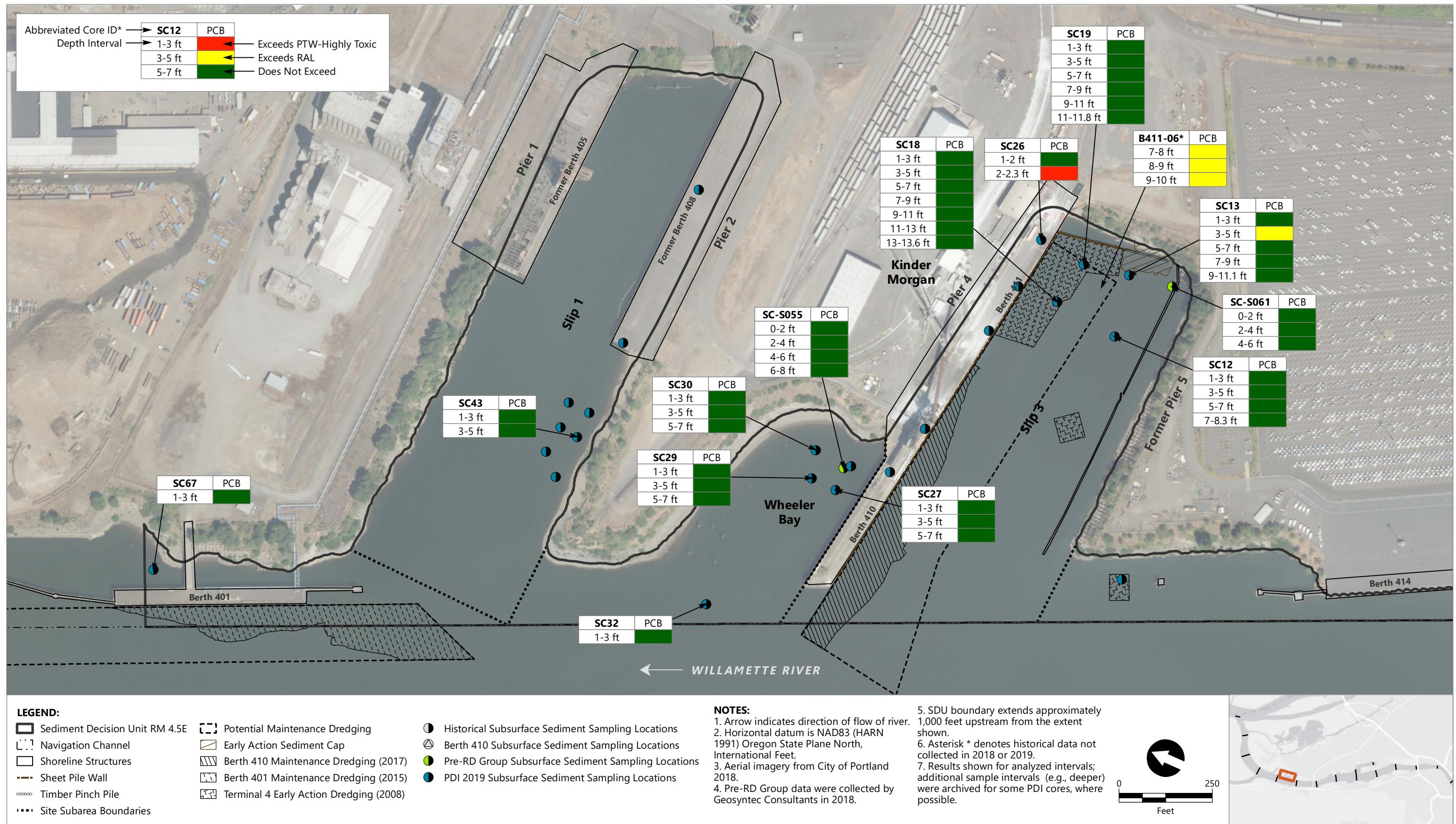
6. Gray values with a "U" qualifier represent non-detects.



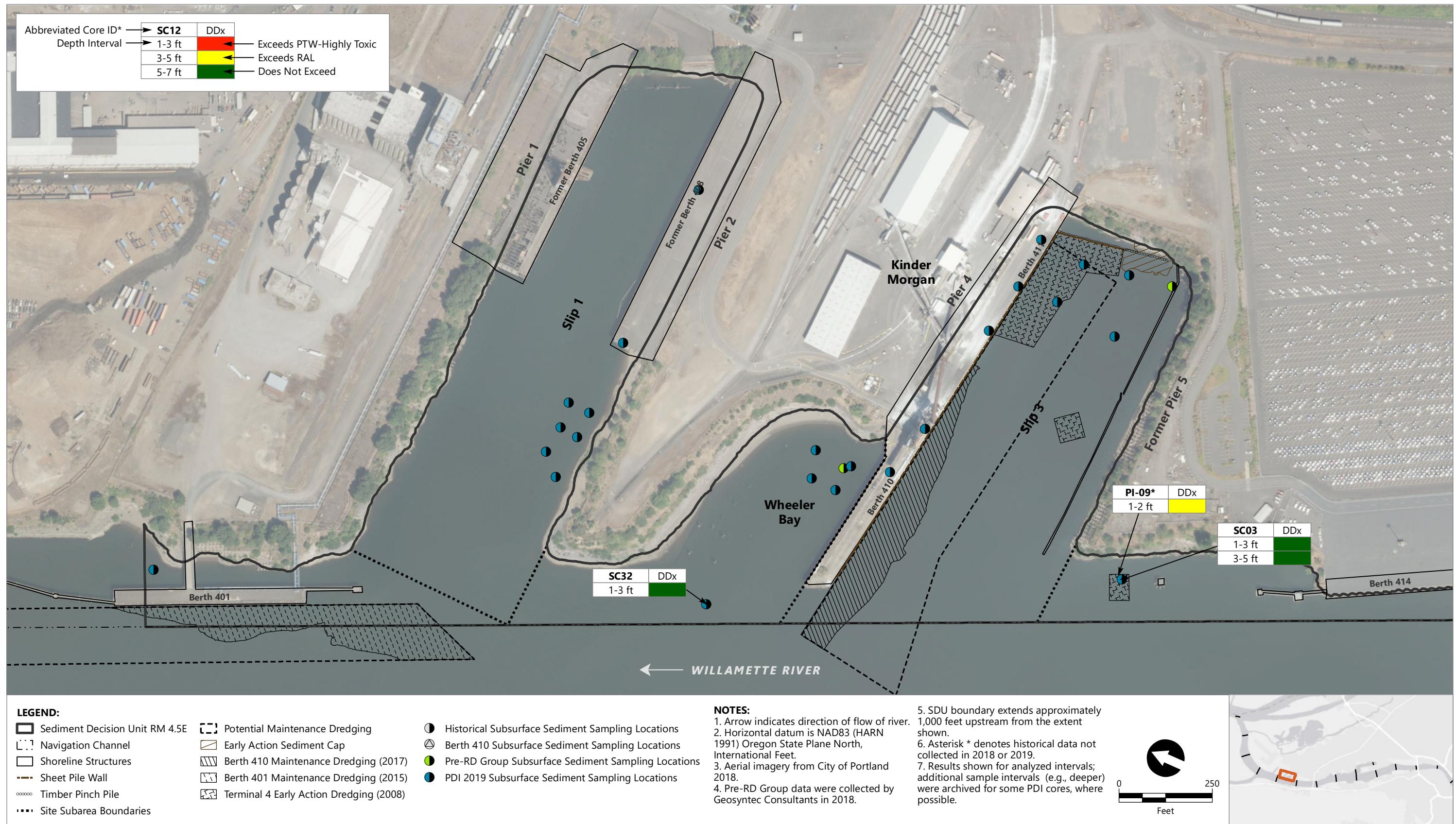
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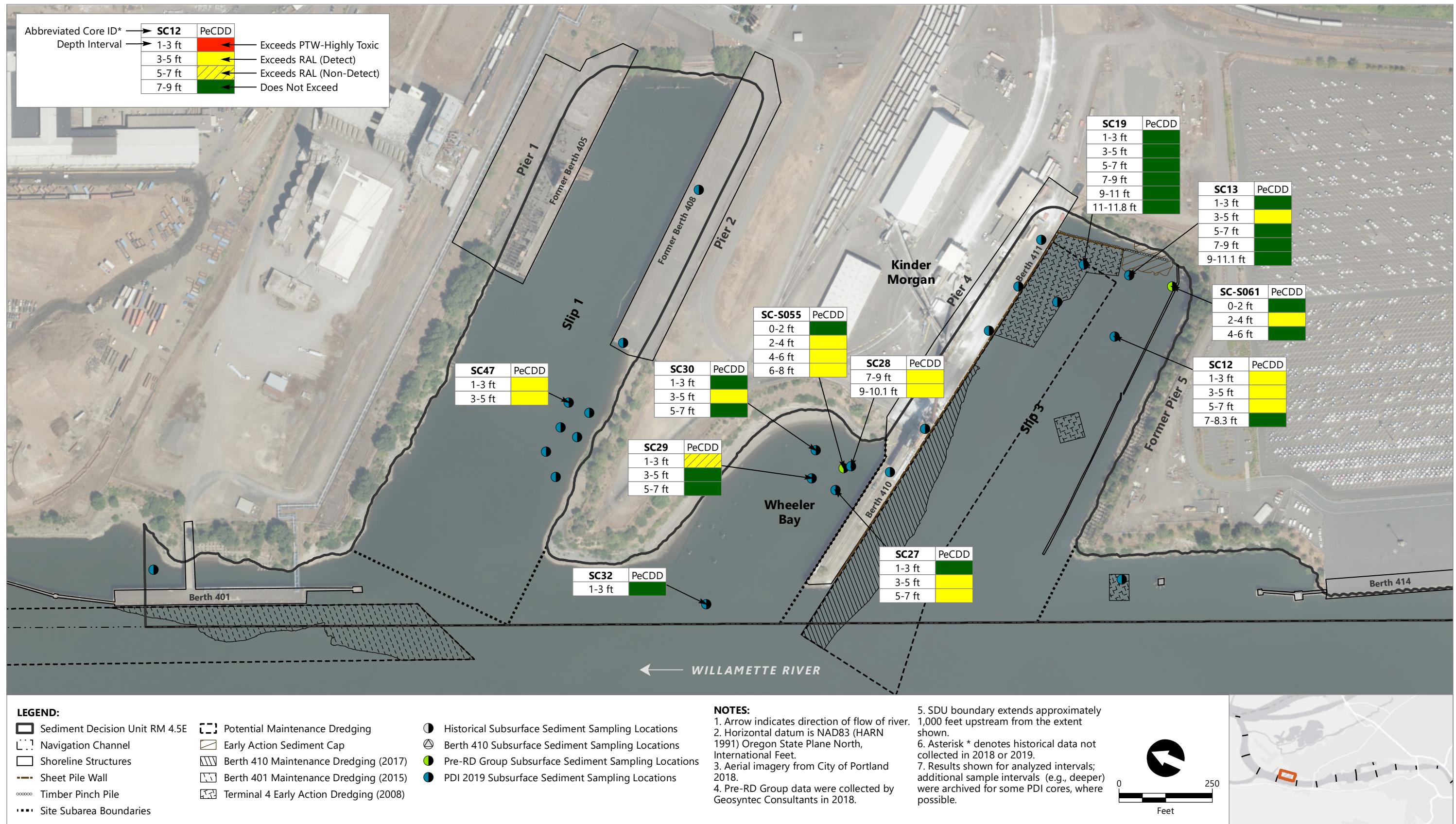
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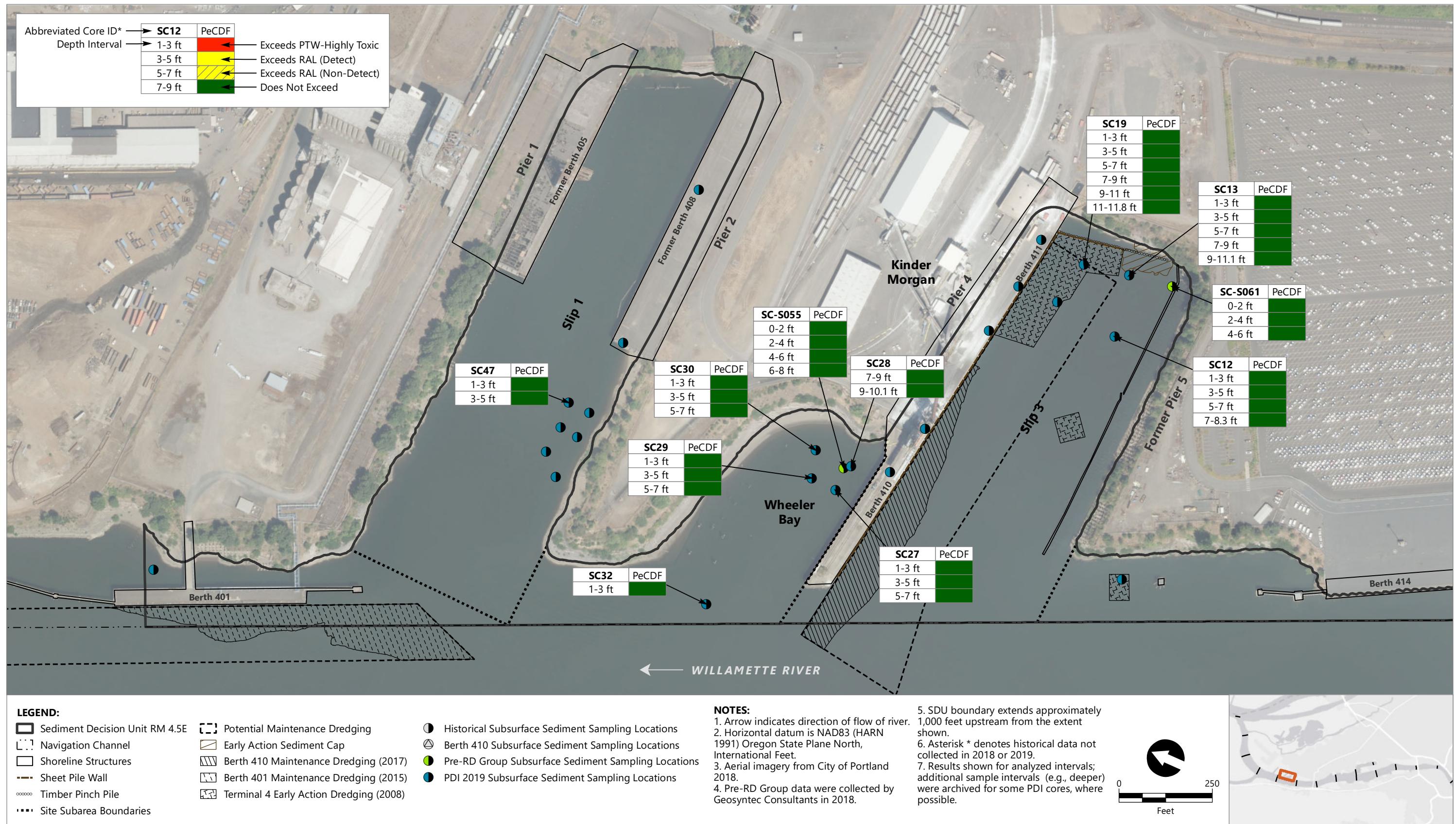
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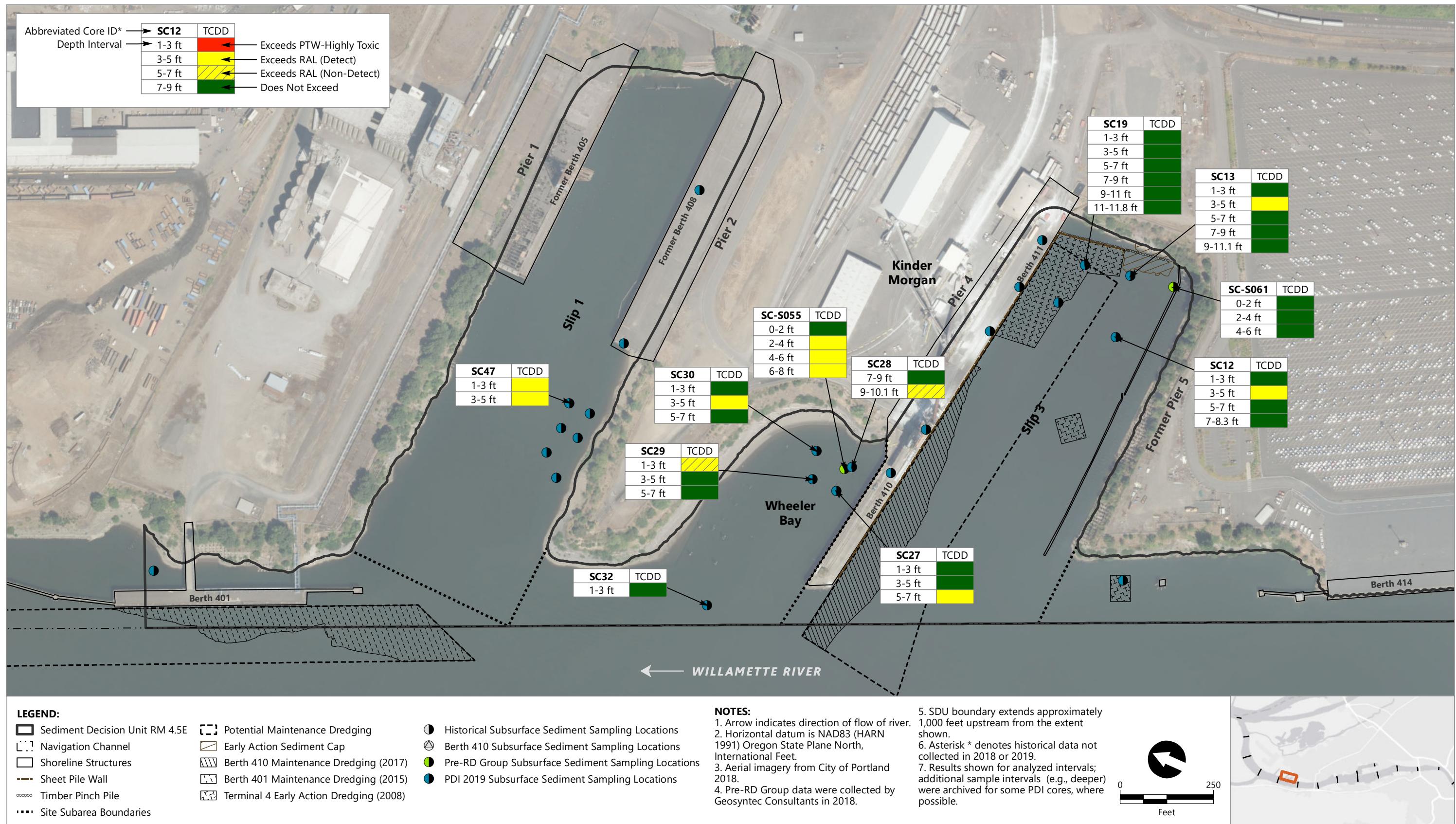
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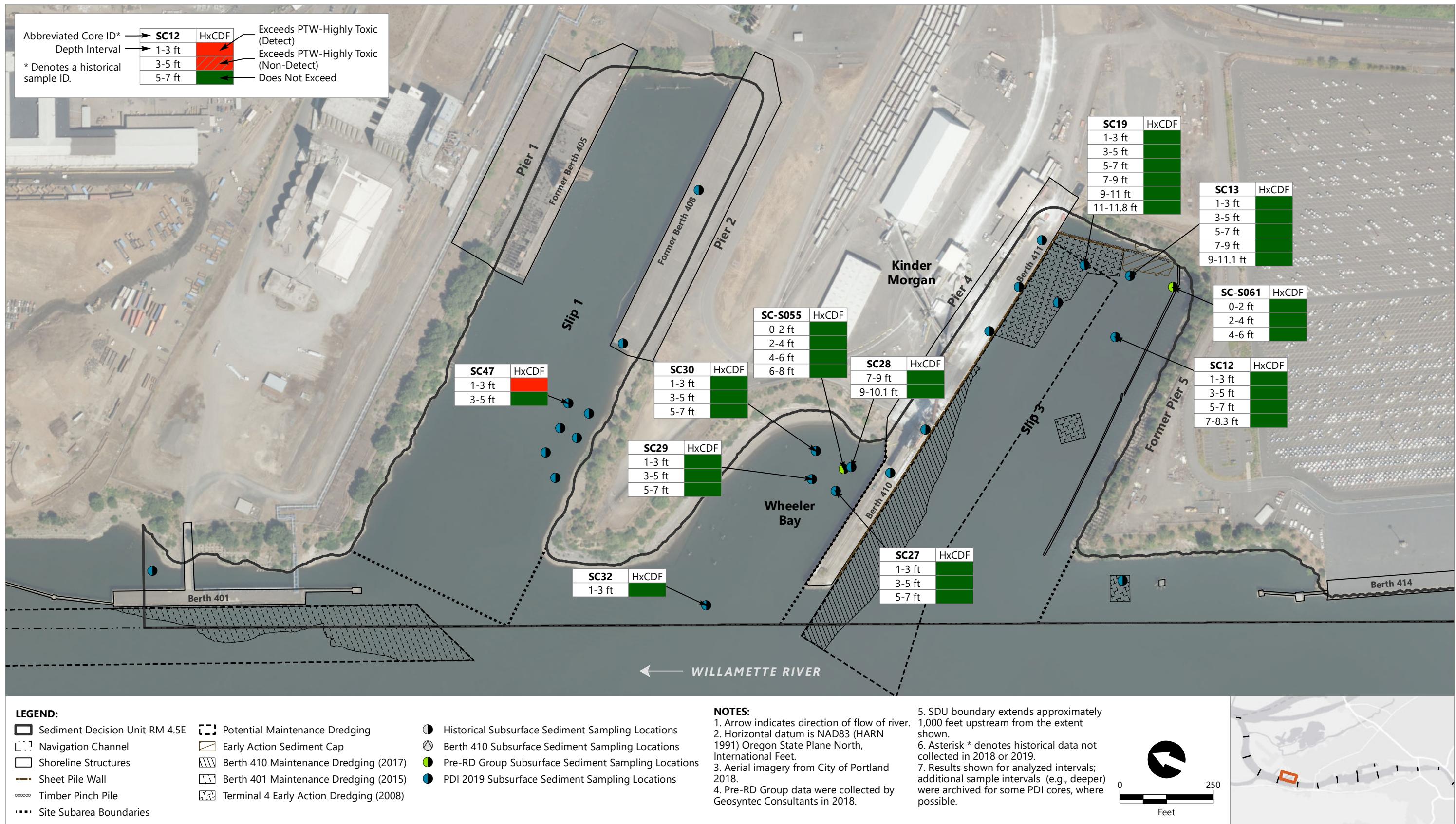
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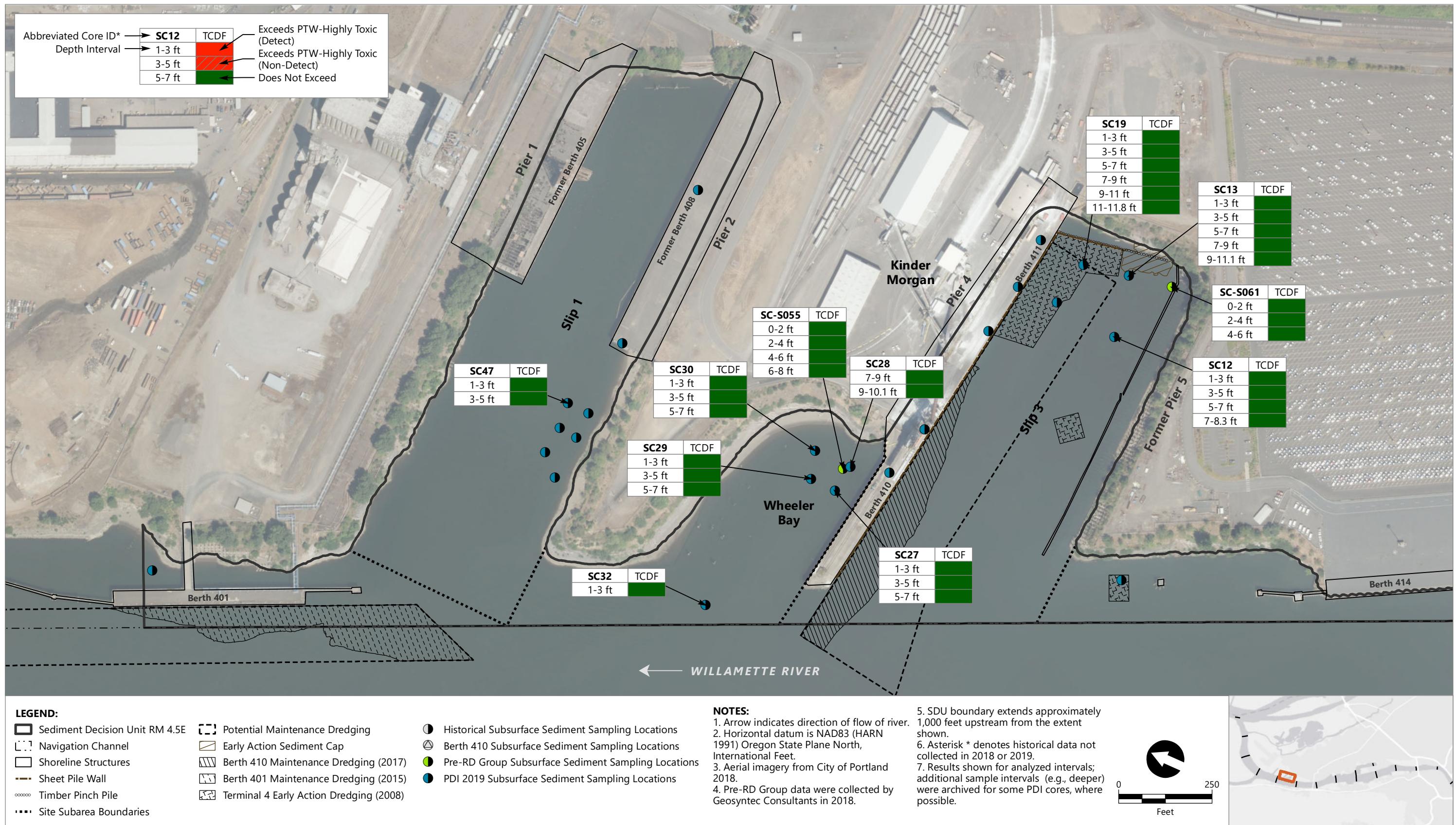


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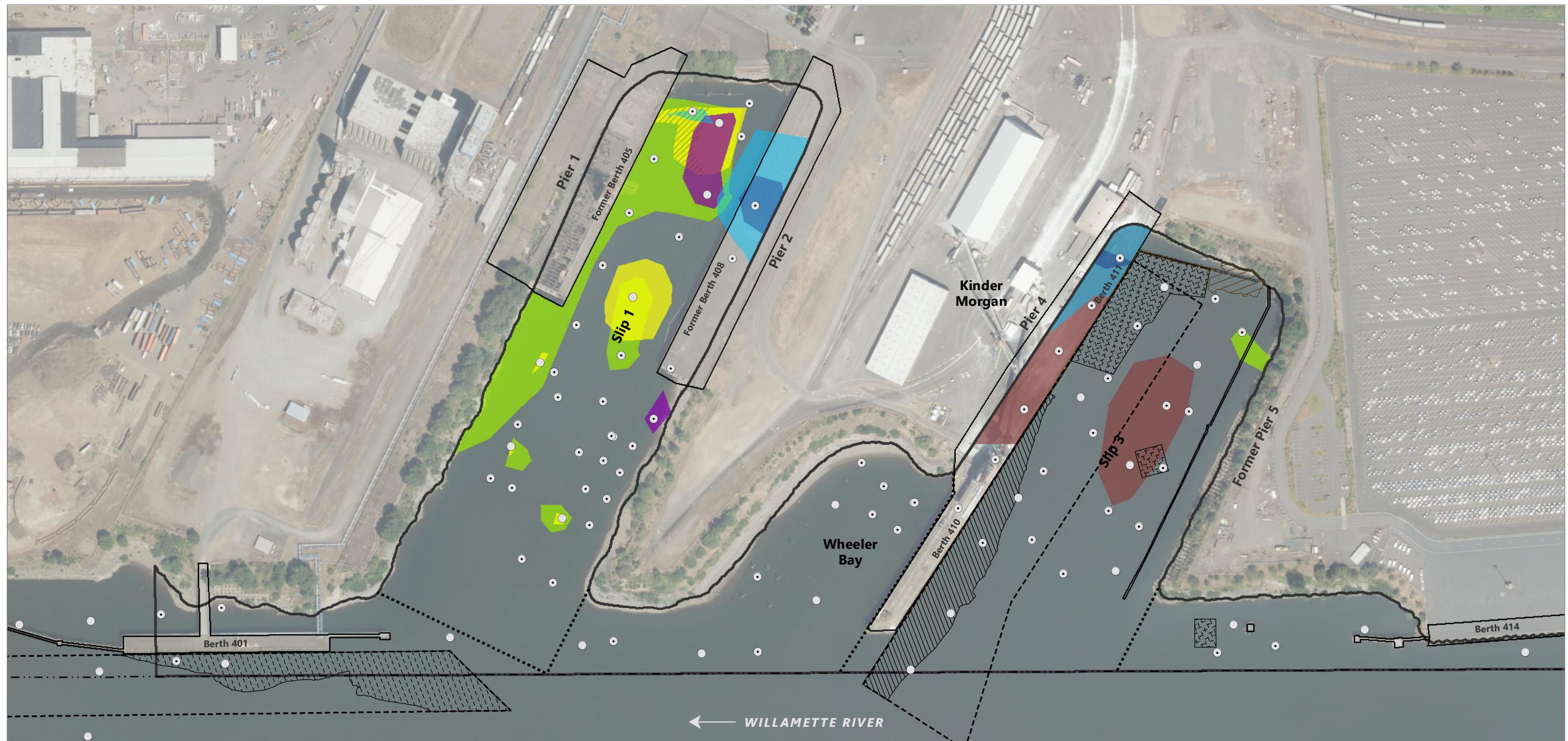


Figure 6-2g
PDI, Pre-RD Group, and Historical Subsurface Sediment Concentrations – 1,2,3,4,7,8-HxCDF

Pre-Remedial Design Investigation Summary Report
Terminal 4 Remedy



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LEGEND:

- Sediment Decision Unit RM 4.5E
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Potential Maintenance Dredging
- Early Action Sediment Cap
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)
- PDI Surface Sediment Sampling Locations

NOTES:

1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
3. Aerial imagery from City of Portland 2018.
4. SDU boundary extends approximately 1,000 feet upstream from the extent shown.
5. PDI Surface SMAs are an initial refinement of ROD SMAs; additional refinement will occur during remedial design.

0 250 Feet

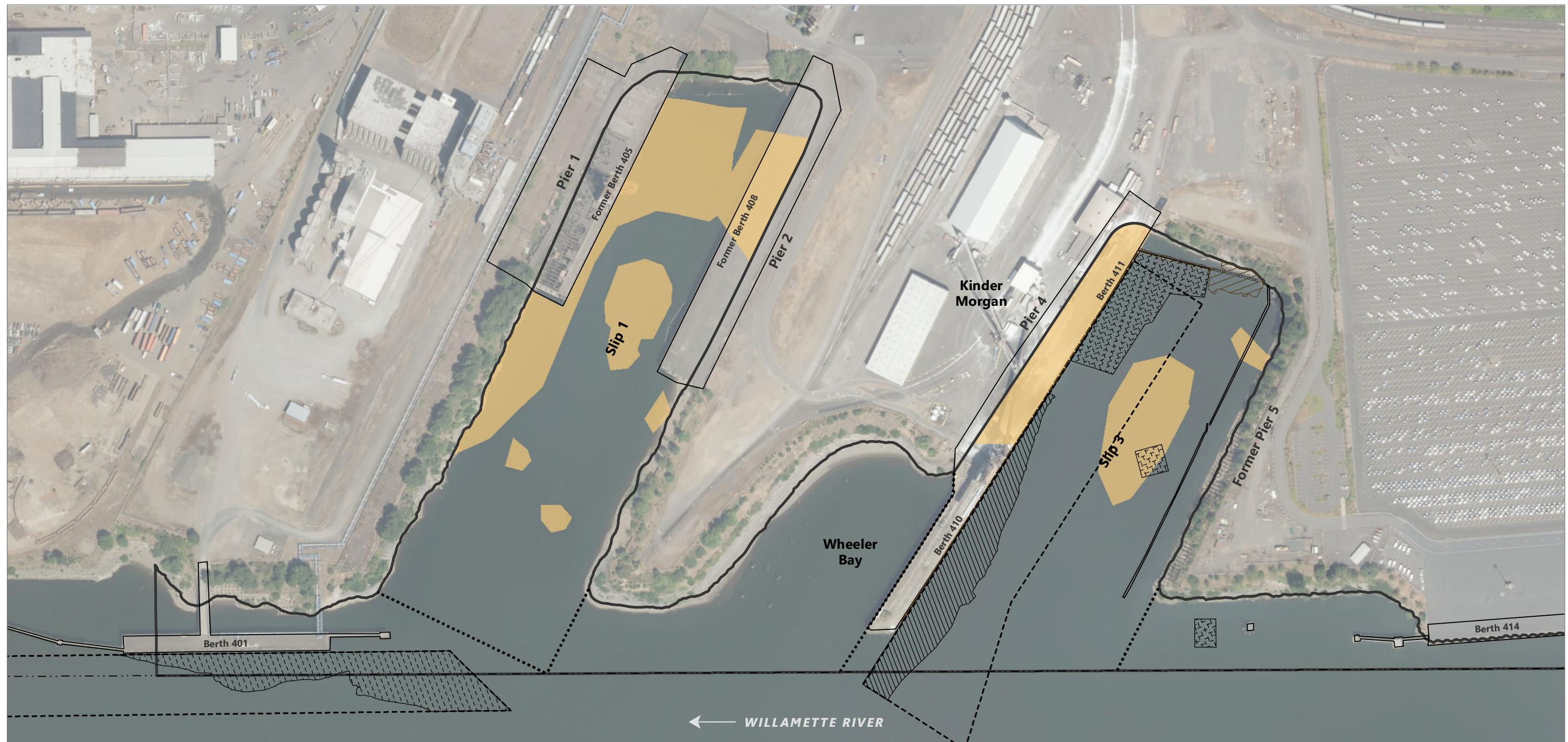
Surface SMA Footprints

- Total PAHs > RAL (30,000 µg/kg)
- 1,2,3,7,8-PeCDD > RAL (0.0008 µg/kg)
- D/F Detection Limit Above RAL
- Total PCBs > PTW-Highly Toxic (200 µg/kg)
- Total PCBs > RAL (75 µg/kg)
- 2,3,7,8-TCDD > RAL (0.0006 µg/kg)
- 1,2,3,4,7,8-HxCDF > PTW-Highly Toxic (0.04 µg/kg)

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Figure 6-3
PDI Surface SMA Footprints for Each COC
Pre-Remedial Design Investigation Summary Report
Terminal 4 Remedy

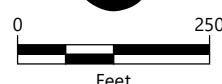


LEGEND:

- Sediment Decision Unit RM 4.5E
- Potential Maintenance Dredging
- Revised Surface Sediment Management Area
- Navigation Channel
- Shoreline Structures
- Sheet Pile Wall
- Timber Pinch Pile
- Site Subarea Boundaries
- Early Action Sediment Cap
- Berth 410 Maintenance Dredging (2017)
- Berth 401 Maintenance Dredging (2015)
- Terminal 4 Early Action Dredging (2008)

NOTES:

1. Arrow indicates direction of flow of river.
2. Horizontal datum is NAD83 (HARN 1991) Oregon State Plane North, International Feet.
3. Aerial imagery from City of Portland 2018.
4. SDU boundary extends approximately 1,000 feet upstream from the extent shown.
5. PDI Surface SMAs are an initial refinement of ROD SMAs; additional refinement will occur during remedial design.



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